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Economic and Social Characteristics of Bottomfish Fishing in the Main Hawaiian Islands

Justin Hospital
Courtney Beavers

April 2012

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Economic and Social Characteristics of Bottomfish Fishing in the Main Hawaiian Islands

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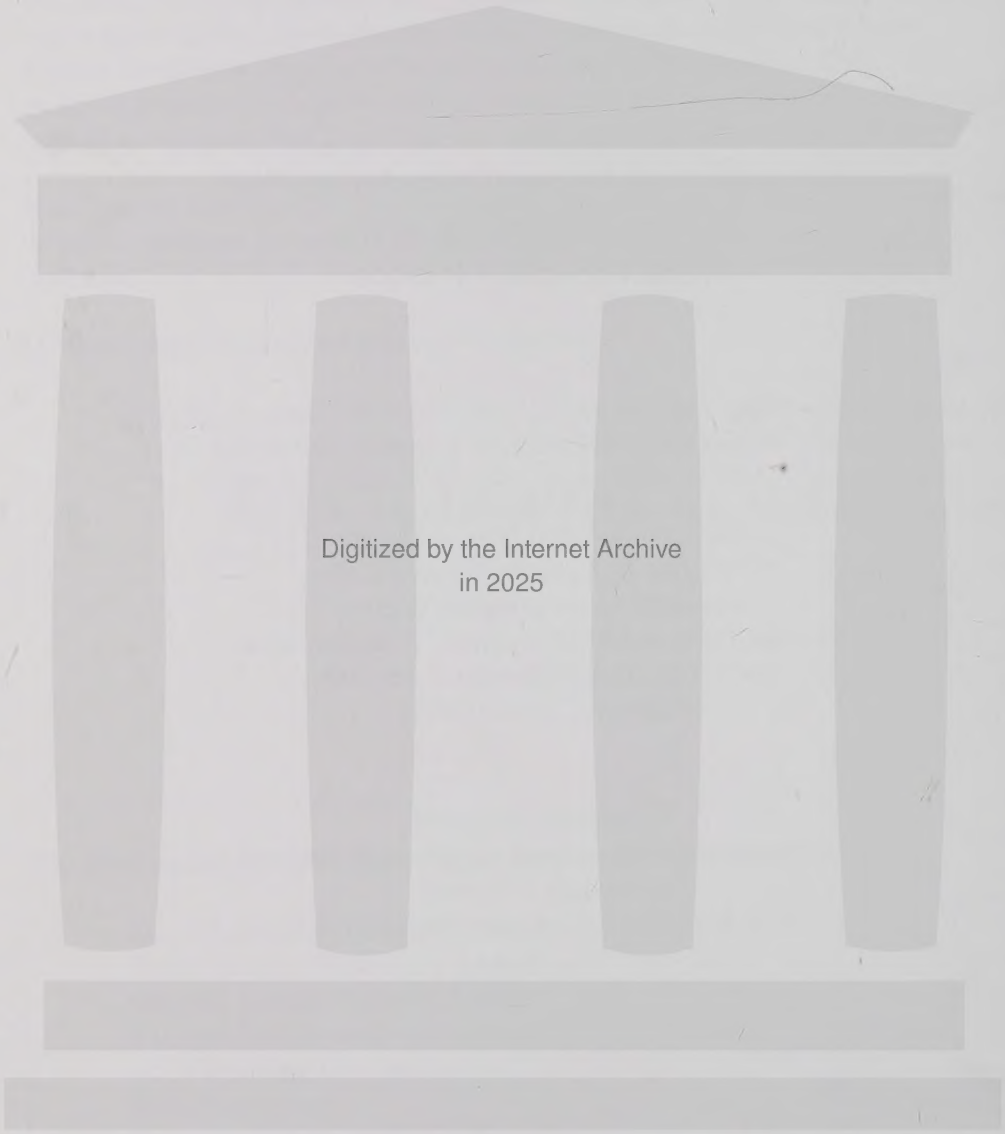

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EXECUTIVE SUMMARY

This report presents an empirical snapshot of the main Hawaiian Islands (MHI) bottomfish fishery using results from a cost-earnings survey of the fleet conducted in 2010. Survey booklets were mailed to 1012 bottomfish fishermen across the State of Hawaii, and 519 surveys were returned, a 51% response rate. Any fisherman that had held a State of Hawaii commercial marine license and reported the catch of any bottomfish management unit species (BMUS) since November 2008 received a survey. This accounted for 91% of our survey population. The remainder of fishermen surveyed were fishermen who have held a federal noncommercial bottomfish permit, which is required of noncommercial fishermen who land bottomfish in federal waters.

Today's MHI bottomfish fishery is composed of a complex mix of commercial, recreational, cultural, and subsistence fishermen whose fishing behaviors do not fit easily into existing legal and regulatory frameworks, thereby complicating the monitoring and management aspects of the fishery. This paper profiles the current MHI bottomfish fleet and details current levels of fishing activity, behavioral aspects of bottomfish fishing, market participation, average trip costs, fishing-related expenditures, levels of investment, and the social and cultural importance of bottomfish fishing. This is the first study to specifically address the MHI bottomfish fleet, and establishes important baselines for assessing the economic and social impacts of any future management actions.

The demographics of the MHI bottomfish fishery reveal the rich tradition and cultural importance of bottomfish fishing in Hawaii as 51% of the fishermen in our survey are 55 years or older and have been targeting bottomfish for an average of 19 years. Participants in the MHI bottomfish fishery are more likely to identify themselves as Asian or Native Hawaiian/Pacific Islander relative to the general population of the State of Hawaii, and we find higher rates of unemployment amongst fishery highliners, emphasizing the economic importance of the fishery resources for this group of the fishery.

The typical vessel in the MHI bottomfish fleet measures approximately 23 feet long with 201 horsepower, was built in the late 1980s, and purchased in the late 1990s. We find that fishery highliners, on average, fish on larger and more powerful boats than other bottomfish fishermen. The fishery is heavily owner-operated as 92% of survey respondents reported to own the vessel on which they fish. Nearly 34% of fishermen reported to always fish alone on bottomfish trips and 82% of the fleet consists of, at most, a two-person operation.

MHI bottomfish fishery participants use a number of different gears over the course of the year and fishermen responding to the survey reported that, on average, approximately 39% of their fishing trips in the past 12 months were primarily bottomfish trips. This would suggest that bottomfish fishing, while not their primary fishing target, holds significant importance for a majority of those active in the fishery, especially given the shortened bottomfish fishing seasons (approximately 6 months) due to quota management

in recent years. Our results suggest that only about 30% of the fleet could be considered *primarily* bottomfish fishermen. Nearly all bottomfish fishing trips (89%) in the past 12 months were single day (or night) trips. This finding holds across nearly all subgroups in the fishery with the exception of fishery highliners who reported that approximately 37% of their bottomfish trips were multiday trips. Our survey respondents indicated that the majority of bottomfish trips (66%) in the past 12 months are limited to state waters only. This behavior varied by county suggesting the potential for distributional effects of existing spatial regulations. Nearly all bottomfish fishing effort on the islands of Kauai (87%) and Hawaii (86%) are exclusively in state waters, whereas fishermen from Oahu and Maui County are more active in Federal waters

During 2009 and 2010, a bottomfish trip averaged approximately $212 with a median cost of $160. As anticipated, fuel expenses accounted for a majority (56%) of total trip expenditures. Bait, the next largest contributor to total trip costs, accounted for 15%. On average, commercially licensed fishermen spent a larger percentage on ice as compared to noncommercial fishermen, and noncommercial fishermen spent a larger percentage on food and beverage compared to commercially licensed fishermen.

The breakdown of catch disposition in the Hawaii bottomfish fishery reflects the social and cultural motivations towards fishing and sheds light on the complexities of classifying catch in the fishery. Fishermen who responded to our survey reported that approximately 24% of bottomfish catch was consumed at home, while 33% was given away, with approximately 40% of bottomfish sold. Twenty-one percent of commercially licensed fishermen did not sell any bottomfish in the past 12 months. This diversity of catch disposition extends to highliners in the fishery, as fishermen who reported catch greater than 1000 pounds of Deep 7 bottomfish in the past 12 months still retain approximately 20% of the bottomfish they catch for home consumption and participation in traditional fish-sharing networks and customary exchange. Additionally, nearly 62% of survey respondents consider the bottomfish they catch to be an important food source for their family. These findings validate the importance of bottomfish fishing in terms of building and maintaining social and community networks, perpetuating fishing traditions, and providing fish to local communities as a source of food security.

While fishery highliners appear to be able to regularly recover trip expenditures and make a profit from bottomfish fishing trips, many supplement their income with other fishing activities. However, based on the average catch disposition of MHI bottomfish, it is clear that for a large majority of fishery participants the social and cultural motivations for bottomfish fishing far outweigh any economic prospects.

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INTRODUCTION

The main Hawaiian Islands (MHI) bottomfish fishery is a hook-and-line fishery that primarily targets deepwater snappers and groupers in deep-slope habitat located between 50 and 200 fathoms. The Hawaii bottomfish management unit species (BMUS) complex consists of 14 species of snapper, grouper, and jacks. Of particular interest to management is a subgroup of species, important economically and culturally, known collectively as the *Deep 7*[1].

In economic terms, the small-scale MHI bottomfish fishery pales in relation to large pelagic fisheries in the region, but its cultural significance is profound. Bottomfish fishing was a part of the economy and culture of the indigenous people of Hawaii long before European explorers first visited the islands (Spalding, 2006). Descriptions of traditional fishing practices indicate that native Hawaiians harvested the same deep-sea bottomfish species as the modern fishery and used some of the same specialized gear and techniques employed today (WPRFMC, 2009). Today's MHI bottomfish fishery is a complex mix of commercial, recreational, cultural, and subsistence fishermen whose fishing behaviors do not fit easily into existing legal and regulatory frameworks, complicating monitoring and management of the fishery.

The MHI bottomfish fishery has historically been an open access fishery with steady growth throughout the 1970s into the 1980s. Landings peaked in 1988 at approximately 1.2 million pounds, valued at $6.3 million (in 2010 dollars). The following decades saw steady declines in fishery production with landings dropping to 315 thousand pounds in 2006, a 73% decline from the historical peak.

In 2005, the National Marine Fisheries Service (NMFS) determined that overfishing was occurring for BMUS in the Hawaiian Archipelago and that localized depletion in the MHI was primarily to blame, recommending a reduction in fishing mortality there to address overfishing concerns (WPRFMC, 2005; Moffitt, et al., 2006). The Western Pacific Regional Fishery Management Council took action by instituting an emergency summer closure from May 15, 2007 through September 30, 2007.

In October 2007, after nearly 5 months of emergency closure, the MHI bottomfish fishery reopened under a total allowable catch (TAC) management regime with a commercial quota of 178 thousand pounds at which point both the commercial and noncommercial bottomfish fisheries would close until the next fishing season. This represented a stark shift in fisheries management in Hawaii as no other comparable fishery in the MHI has ever been subject to a quota.

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[1] The *Deep 7* species include: ehu (*Etelis carbunculus*), gindai (*Pristipomoides zonatus*), kalekale (*Pristipomoides sieboldii*), hapuupuu (*Epinephelus quernus*), onaga (*Etelis corsucans*), opakapaka (*Pristipomoides filamentosus*), and lehi (*Aphareus rutilans*).

This report presents an empirical snapshot of the MHI bottomfish fishery using results from a cost-earnings study of the fleet conducted in 2010. Prior to this research, aside from Hamilton and Huffman (1997), little information about the operational aspects of the MHI bottomfish fleet was available. Using recent survey data, this paper profiles the current MHI bottomfish fleet and details current levels of fishing activity, behavioral aspects of bottomfish fishing, market participation, average trip costs, fishing-related expenditures, levels of investment, and the social and cultural importance of bottomfish fishing. These findings provide fishery managers with insights into the economic and social context of the fishery and could help guide the design and analysis of future management alternatives.

SURVEY METHODS

A modified Dillman mail survey methodology was implemented including a pre-letter, initial survey mailing, postcard reminder, and second mailing (Dillman et al., 2008). A copy of the survey questionnaire is provided in the Appendix. Survey booklets were mailed to 1012 bottomfish fishermen across the state of Hawaii between April and June 2010. Any fisherman that has held a state of Hawaii commercial marine license (CML) and reported the catch of any BMUS since November of 2008 received a survey. This included the bulk (916 or 91%) of our survey population. The remainder (96 or 9%) of our survey population consisted of fishermen that have held a federal noncommercial bottomfish permit, at some point in time, since its introduction in 2007. The noncommercial permit is required of noncommercial fishermen that land BMUS in federal waters (from 3 to 200 miles offshore). We had no means to symmetrically contact noncommercial bottomfish fishermen who fished exclusively in state waters, as there is no current licensing or reporting requirements.

RESPONSE RATES

A total of 519 surveys were completed, which is equivalent to a response rate of approximately 51% (see Table 1). However, response rates of subgroups within the survey population varied spatially and by avidity. Commercial fishermen that target Deep 7 species and were active in the 2009 – 2010 fishing season had a response rate of 60%. Fishermen not active in the most recent fishing season (30%), those not targeting Deep 7 species (46%), and noncommercial permit holders (43%) showed lower response rates. Our results exhibit slight avidity bias, as approximately 80% of our survey respondents were active in the past 12 months (April 2009–April 2010), with 87% active in the most recent fishing season (September 2009–April 2010), compared to 73% of our total survey population, but this is to be expected and reinforces the validity of our survey findings as

reflecting the operational characteristics for the fleet. For a more detailed analysis of survey response rates and population distributions, see Hospital and Beavers (2011).

The commercially licensed population of the MHI bottomfish fleet is distributed relatively evenly across the State of Hawaii, with the highest percentage found on the islands of Hawaii and Oahu (34.4% and 32.9%, respectively). The Maui Nui complex (Maui, Molokai, and Lanai) has 20.5% of the bottomfish fleet, whereas 12.3% live on the island of Kauai. As shown in Table 2, the distribution of our survey respondents is representative of the active fishery population distribution.

Our noncommercial population is dominated by Oahu fishermen as they comprise 82% of noncommercial permit holders. The distribution for our noncommercial survey sample is representative of active noncommercial fishers (valid permit as of April 2010).

Table 1.--Survey population and response rates.

County	Number of commercial Fishermen (% total)	Complete Surveys	Commercial response (%)	Number of Noncommercial permits	Complete Surveys	Noncommercial response (%)	Total response (%)
Kauai	112 (12.3)	59	52.7	7	2	28.6	51.3
Oahu	300 (32.9)	189	63.0	68	30	44.1	59.5
Maui[a]	187 (20.5)	92	49.2	9	6	66.7	50.0
Hawaii	314 (34.4)	135	43.0	12	3	25.0	42.3
Total fleet	913[b]	476[c]	51.9	96	41	42.7	51.3

[a]We received a response rate of 58% from Molokai fishermen (8 of 14) and 78% from Lanai (7 of 9).
[b]Additionally, there were three respondents with mainland U.S. addresses making our total commercially licensed population equal to 916.
[c]We received two completed surveys from mainland respondents making our complete commercial total equal to 478. Due to confidentiality concerns, these responses are not presented separately in this report.

Table 2.--Percentage distribution of active (2009-2010) bottomfish survey population.

County	Active BMUS	Complete Surveys	Active Deep 7 Fishermen	Complete Surveys	Valid Noncommercial	Complete Surveys
Kauai	12.9	12.7	11.6	12.3	1.7	0
Oahu	34.5	36.9	31.9	34.3	82.1	82.1
Maui	20.6	20.3	20.7	20.7	10.7	10.7
Hawaii	32.0	30.1	35.8	32.7	5.5	7.2
Total fleet	100	100	100	100	100	100

RESULTS

In this report, survey responses are presented for our complete survey respondent pool as well as for relevant subgroups of the fleet. Most tables provide county-level breakdowns and distinctions between those holding State of Hawaii commercial marine licenses (CMLs) and federal noncommercial bottomfish permits. Additionally, CML holders are further disaggregated to consider fishery highliners, which for the purpose of this report are defined as those reporting the catch of more than 1000 pounds of Deep 7 bottomfish in the past 12 months. We feel this is an appropriate distinction, as the 15% of the fleet

meeting this definition were responsible for 78% of total catch between April 2009 and April 2010. In some instances, distinctions will be made between fishermen who reported targeting Deep 7 bottomfish and those targeting other BMUS or no particular target species. Lastly, in a few tables, comparisons will be made between those active in the most recent fishing season at the time of survey fielding (September 2009 – April 2010), relative to those who had not fished bottomfish in the most recent season.

Demographics

This section presents a demographic profile of participants in the MHI bottomfish fishery. It is important to understand the socioeconomic composition of fishery participants to understand the potential for differential economic and social impacts from regulatory measures. Nearly half (51%) of our survey respondents were 55 years or older. This age distribution is understandable given the capital requirements of owning a vessel, and the localized knowledge and experience required of bottomfish fishing. Not surprisingly, fishery highliners, on average, are younger than the rest of the fleet, likely associated with the physical requirements of avid bottomfish fishing. The age distribution for subgroups of our survey respondents is presented in Table 3.

Table 3.--Survey Responses: "What is your age?"

Percentage of Responses [*n*]	Less than 25 years (%)	25 - 34 years (%)	35 - 44 years (%)	45 - 54 years (%)	55 - 64 years (%)	More than 65 years (%)
Full Sample [515]	**1.0**	**6.6**	**14.5**	**27.2**	**32.6**	**18.1**
by Island						
Kauai [60]	1.7	6.7	25.0	26.7	26.7	13.3
Oahu [217]	0.9	4.2	12.4	29.0	33.2	20.3
Maui [98]	0.0	11.2	12.2	28.6	33.7	14.3
Hawaii [137]	1.5	7.3	15.3	23.4	33.6	18.9
by Classification						
CML holder [473]	1.1	6.8	15.6	27.3	31.1	18.2
Highliner [49]	0.0	10.2	22.5	24.5	36.7	6.1
Not Highliner [424]	1.2	6.4	14.9	27.6	30.4	19.6
Noncommercial [42]	0.0	4.8	2.4	26.2	50.0	16.7
By Target						
Deep 7 [295]	0.7	7.5	13.2	29.2	33.6	15.9
Other BMUS/None [220]	1.4	5.5	16.4	24.6	31.4	20.9
By Fished in most recent season						
Yes [433]	0.9	5.3	15.0	26.8	33.7	18.2
No [82]	1.2	13.4	12.2	29.3	26.8	17.1

Fishermen responding to our survey have been targeting bottomfish for an average of 19 years, providing evidence of a rich tradition of bottomfish fishing within the fleet. Active fishery highliners have been targeting bottomfish for an average of approximately 23 years as compared to noncommercial bottomfish fishermen and fishermen who were not

active in the most recent season (16 years and 14 years, respectively). The distributions of years targeting bottomfish for subgroups of the fleet are presented in Table 4.

Table 4.--Survey Responses: "How long have you targeted bottomfish?"

Percentage of Responses [*n*]	Less than 3 years (%)	3 - 5 years (%)	6 - 10 years (%)	11 - 15 years (%)	16 - 20 years (%)	More than 20 years (%)
Full Sample [496]	**11.5**	**13.9**	**12.3**	**8.3**	**15.5**	**38.5**
by County						
Kauai [59]	8.5	10.2	10.2	10.2	16.9	44.1
Oahu [207]	13.0	15.5	11.6	7.7	18.4	33.8
Maui [94]	7.5	13.8	19.2	8.5	10.6	40.4
Hawaii [133]	13.5	13.5	9.8	7.5	14.3	41.4
by Classification						
CML holder [457]	10.9	12.7	12.7	8.1	16.2	39.4
Highliner [48]	2.1	4.2	14.6	2.1	25.0	52.1
Not Highliner [409]	11.9	13.7	12.5	8.8	15.2	37.9
Noncommercial [39]	17.9	28.2	7.7	10.3	7.7	28.2
By Target						
Deep 7 [288]	6.6	11.8	13.9	9.0	16.7	42.0
Other BMUS/None [208]	18.3	16.8	10.1	7.2	13.9	33.7
By Fished in most recent season						
Yes [422]	8.1	13.7	12.6	8.1	17.5	40.1
No [74]	31.1	14.9	10.8	9.5	4.1	29.7

The majority of fishermen who responded to the survey (59%) described themselves as Asian, followed by White (25.8%) and Native Hawaiian or Pacific Islander (21.2%). As shown in Table 5, fishermen in the MHI bottomfish fishery are more likely to identify themselves as Asian or Native Hawaiian/Pacific Islander relative to the general population of the State of Hawaii, based on data from the 2010 American Community Survey administered by the U. S. Census Bureau (U.S. Census Bureau, 2010). This diversity confirms the cultural significance of the highly prized Deep 7 species, among local island populations, due in large part to the red color of many of these fish. This distinctive characteristic is symbolic of good luck in Asian and local island culture and thus deemed important at celebrations for significant life events, including holidays, weddings, birthdays, and graduations.

Table 5.--Survey Responses: "How would you describe your race?"

Percentage of Responses [*n*]	American Indian / Native Alaskan (%)	Asian (%)	Black or African American (%)	Hispanic or Latino (%)	Native Hawaiian/ Pacific Islander (%)	White (%)	Two or More (%)
Full Sample [519]	**1.7**	**59.2**	**0.2**	**1.9**	**21.2**	**25.8**	**10.2**
State of Hawaii (2010)	0.3	37.1	2.3	9.0	8.8	26.9	23.6
by County							
Kauai [61]	3.3	50.8	0.0	3.3	26.2	29.5	13.1
Oahu [219]	0.0	73.1	0.5	1.8	14.6	18.7	9.1
Maui [98]	1.0	55.1	0.0	3.1	19.4	33.7	7.1
Hawaii [138]	4.4	44.2	0.0	0.7	30.4	29.7	13.0
by Classification							
Commercial [477]	1.9	57.2	0.2	2.1	21.8	27.3	10.7
Highliner [49]	0.0	53.1	0.0	0.0	20.4	34.7	6.1
Not Highliner [428]	2.1	57.7	0.2	2.3	21.9	26.4	11.2
Noncommercial [42]	0.0	80.9	0.0	0.0	14.3	9.5	4.8
By Target							
Deep 7 [297]	2.0	60.9	0.0	0.3	18.2	25.9	8.4
Other BMUS/None [222]	1.4	56.8	0.5	4.1	25.2	25.7	12.6

The majority of fishermen (66%) reported to be employed full-time, part-time or self-employed (see Table 6). Following the age distribution presented in Table 3, nearly 28% of survey respondents indicated that they were currently retired. Unemployment rates for fishermen who responded to the survey were slightly below State of Hawaii general population unemployment figures which hovered around 6.8% during 2009 (State of Hawaii, 2010). However, higher rates of unemployment among fishery highliners were more prevalent, which emphasizes the economic importance and reliance on fishery resources for their livelihood. Also of note, the majority of full-time commercial fishermen defined themselves as self-employed which explains the high percentage among fishery highliners. Those not active in the fishery during the most recent season had slightly higher rates of employment, compared to those actively fishing in the previous season.

Table 6.--Survey Responses: "Are you currently employed?"

Percentage of Responses [*n*]	Employed Full Time (%)	Employed Part Time (%)	Retired (%)	Student Full Time (%)	Unemployed (%)	Self-Employed (%)
Full Sample [513]	**50.1**	**6.4**	**27.7**	**0.2**	**5.7**	**9.9**
by County						
Kauai [60]	58.3	5.0	15.0	0.0	5.0	16.7
Oahu [216]	56.0	4.6	27.8	0.5	3.2	7.9
Maui [98]	44.9	8.2	27.6	0.0	13.3	6.1
Hawaii [136]	40.4	8.8	33.1	0.0	4.4	13.2
by Classification						
Commercial [471]	49.9	6.8	26.8	0.2	5.9	10.4
Highliner [49]	26.5	12.2	20.4	0.0	12.2	28.6
Not Highliner [422]	52.6	6.2	27.5	0.2	5.2	10.2
Noncommercial [42]	52.4	2.4	38.1	0.0	2.4	4.8
By Target						
Deep 7 [293]	51.5	7.9	24.9	0.0	5.1	10.2
Other BMUS/None [220]	48.2	4.6	31.4	0.5	6.4	9.1
By Fished in most recent season						
Yes [432]	47.5	7.2	28.9	0.0	5.8	10.6
No [81]	64.2	2.5	20.9	1.2	4.9	6.2

As a group, survey respondents were generally well educated with more than 70% reporting to have completed some college, hold an associate's, or at least a bachelor's degree (Table 7). Noncommercial permit bottomfish fishermen reported the highest level of education with 45% having completed a bachelor's degree or higher.

Table 7.--Survey Responses: "What is the highest level of education you have completed?"

Percentage of Responses [*n*]	Less than High School Graduate (%)	High School Graduate (%)	Some College or Associate's Degree (%)	Bachelor's Degree or higher (%)
Full Sample [514]	**4.5**	**24.3**	**47.3**	**23.9**
State of Hawaii (2010)*	9.6	28.9	32.0	29.5
by County				
Kauai [60]	5.0	31.7	50.0	13.3
Oahu [217]	3.7	21.2	44.2	30.9
Maui [98]	3.1	25.5	54.1	17.4
Hawaii [136]	6.6	25.7	47.1	20.6
by Classification				
Commercial [472]	4.2	26.3	47.5	22.0
Highliner [49]	4.1	28.6	40.8	26.5
Not Highliner [423]	4.3	26.0	48.2	21.5
Noncommercial [42]	7.1	2.4	45.2	45.2
By Target				
Deep 7 [294]	2.7	22.1	45.6	29.6
Other BMUS/None [220]	6.8	27.3	49.6	16.4
By Fished in most recent season				
Yes [432]	3.7	23.4	48.8	24.1
No [82]	8.5	29.3	39.0	23.2

*State of Hawaii data comes from the 2010 American Community Survey (U.S. Census Bureau, 2010).

Compared to the general population of the State of Hawaii, household income for MHI bottomfish fishermen was found to be distributed similarly, although with a slightly higher percentage of fishing households in the $50,000 to $99,000 range. Closely related to the education distribution, we find noncommercial bottomfish permit fishermen were found to be the slightly more affluent (Table 8).

Table 8.--Survey Responses: "What was your total household income, before taxes, in 2009, including fishing income?"

Percentage of Responses [*n*]	Less than $25,000 (%)	$25,000 - $49,999 (%)	$50,000 - $99,999 (%)	$100,000 - $149,999 (%)	$150,000 - $199,999 (%)	$200,000 or more (%)
Full Sample [487]	**12.0**	**24.0**	**42.7**	**14.2**	**4.1**	**3.1**
State of Hawaii (2009)*	17.5	21.9	33.7	16.3	6.2	4.5
by County						
Kauai [57]	15.8	28.1	35.1	15.8	1.8	3.5
Oahu [205]	9.3	18.5	46.8	17.1	5.4	2.9
Maui [94]	12.8	26.6	38.3	12.8	4.3	5.3
Hawaii [128]	14.1	29.7	42.2	9.4	3.1	1.6
by Classification						
Commercial [450]	12.4	24.9	42.4	13.8	3.8	2.7
Highliner [47]	8.5	23.4	51.1	12.8	2.1	2.1
Not Highliner [403]	12.9	25.1	41.4	13.9	3.9	2.7
Noncommercial [37]	5.4	13.5	45.9	18.9	8.1	8.1
By Target						
Deep 7 [278]	9.4	23.0	44.2	14.8	5.0	3.6
Other BMUS/None [209]	15.3	25.4	40.7	13.4	2.9	2.4
By Fished in most recent season						
Yes [416]	11.1	22.8	43.9	14.9	4.6	2.6
No [71]	16.9	30.9	35.2	9.9	1.4	5.6

*State of Hawaii data comes from the 2009 American Community Survey (U.S. Census Bureau, 2009).

Vessel Characteristics

This section presents a profile of vessels that are currently active in the MHI bottomfish fishery. The overwhelming majority of survey respondents (92%) reported that they own the vessel on which they fish. While there was some item nonresponse for questions addressing vessel characteristics, we are confident that our survey findings are representative of the population. The high rates of vessel ownership also ensure that our survey respondents are intimately familiar with vessel specifications, fishing activities, operations, and investment levels presented later in this report.

As shown in Table 9, the average vessel in the MHI bottomfish fleet is approximately 23 feet long with 201 horsepower, was built in the late 1980s, and purchased in the late 1990s. Fishery highliners, on average, fish on larger and more powerful vessels relative to other bottomfish fishermen. Nearly 60% of vessels in the fleet (notably the smaller ones) use gasoline motors while a large percentage (75%) of highliner vessels use diesel.

Table 9.--Vessel characteristics: means, standard errors, and medians.

Variable [*n*]		Full sample [425]	Highliner [46]	Not Highliner [356]	Noncommercial [23]
Total length of boat (feet)	**Mean**	**23.3**	**27.8**	**22.8**	**22.0**
	Standard error	0.3	0.9	0.3	1.0
	Median	22	27	21	22
Boat Horsepower	**Mean**	**201**	**295**	**191**	**178**
	Standard error	6.6	28.3	6.6	20.5
	Median	180	215	176	180
Age of boat (years)	**Mean**	**21.1**	**19.8**	**21.5**	**16.4**
	Standard error	0.6	1.5	0.6	2.4
	Median	21.0	20.5	21.0	14.0
Current boat ownership (years)	**Mean**	**12.5**	**12.3**	**12.6**	**11.8**
	Standard error	0.5	1.2	0.5	2.2
	Median	10.0	10.0	10.0	9.0

As shown in Table 10, the distribution of boat sizes in our sample is also different across subgroups within the fishery. While approximately 70% of fishery highliners own boats larger than 24 feet, the majority of other commercial fishermen and noncommercial fishermen, approximately 69% and 76% respectively, own vessels 24 feet long or shorter.

Table 10.--Distribution of vessel size, by classification.

Percentage of respondents [*n*]	< 16 feet (%)	16 – 24 feet (%)	25 – 30 feet (%)	> 30 feet (%)
Full Sample [465]	**3.2**	**62.2**	**22.6**	**12.0**
CML holders [440]	3.0	61.8	22.7	12.5
Highliner [47]	2.1	27.7	40.4	29.8
Not Highliner [393]	3.1	65.9	20.6	10.4
Noncommercial [25]	8.0	68.0	20.0	4.0

Few instances of sharing of fishing vessels among the fleet occur (Table 11). On average, nearly 85% of vessel owners indicated that their vessel is never used without them. Noncommercial permit holders were the group most likely to share their fishing vessels with others, but rarely (24%). This again reaffirms that our survey respondents are well aware of the operational aspects and investments required of bottomfish fishing.

Table 11.--Survey Response: "Do other people (other than family members) use the boat without you?"

Percentage of respondents [*n*]	Never	Rarely	Sometimes	Often
Full Sample [454]	**84.6**	**9.3**	**3.5**	**2.6**
CML holders [429]	85.8	8.4	3.3	2.6
Highliner [47]	82.9	10.6	4.3	2.1
Not Highliner [382]	86.1	8.1	3.1	2.6
Noncommercial [25]	64.0	24.0	8.0	4.0

Fishing Activity

This section details the fishing activity and operational aspects of bottomfish fishing for the MHI bottomfish fleet. Information presented in this section includes fishing avidity, trip characteristics, temporal and spatial description of bottomfish trips, bottomfish targeting, and catch estimates. A detailed description of bottomfish fishing activities will provide useful information for managers to understand the dynamics and heterogeneity of the fleet.

We sought to characterize the overall fishing avidity of MHI bottomfish fishery participants so that we could better understand the role bottomfish plays in their fishing portfolio and the reliance on bottomfish resources for these fishermen. Using the medians of response bins, on average, our survey respondents reported 38 fishing trips in the past 12 months. Fishery highliners reported taking more fishing trips (59 trips) on average, than other commercially licensed fishermen (38 trips) and noncommercial permit holders (17 trips). Kauai fishermen also reported, on average, more trips (46 trips) compared to the neighbor island counties of Oahu (35 trips), Maui Nui (36 trips), and Hawaii (42 trips). The distribution of total fishing trips taken in the past 12 months is presented in Table 12. Also, evidence shows that those fishermen targeting Deep 7 bottomfish are slightly less active than those who target other BMUS or no particular BMUS species.

Table 12.--Survey Responses: "Approximately how many total fishing trips did you take over the past 12 months?"

Percentage of Responses [*n*]	Less than 25 trips	25 – 49 trips	50 – 99 trips	100 – 200 trips	More than 200 trips
Full Sample [518]	**58.9**	**19.1**	**11.9**	**6.2**	**3.9**
by County					
Kauai [61]	50.8	16.4	19.7	6.6	6.6
Oahu [219]	64.8	17.8	6.9	6.4	4.1
Maui [98]	58.2	20.4	15.3	4.1	2.0
Hawaii [137]	52.6	21.9	14.6	7.3	3.7
by Classification					
Commercial [476]	56.5	19.8	12.8	6.7	4.2
Highliner [49]	28.6	30.6	26.5	8.2	6.1
Not Highliner [427]	59.7	18.5	11.2	6.6	3.9
Noncommercial [42]	85.7	11.9	2.4	0.0	0.0
By Target					
Deep 7 [297]	62.3	17.9	12.5	4.7	2.7
Other BMUS/None [221]	54.3	20.8	11.3	8.1	5.4
By Fished in most recent season					
Yes [433]	56.4	20.8	13.2	6.2	3.5
No [85]	71.8	10.6	5.9	5.9	5.9

Fishermen were then asked what percentage of their fishing trips in the past 12 months were *primarily* bottomfish fishing trips and survey respondents, on average, reported that approximately 39% of fishing trips in the past 12 months were bottomfish trips (using the medians of survey response bins). This would suggest that bottomfish is a secondary gear usage for a majority of those active in the fishery, although this is likely significantly affected by the shortened bottomfish fishing seasons in recent years. Our results suggest that only about 30% of the fleet could be considered primarily bottomfish fishermen (see Table 13).

Fishery highliners are heavily reliant on bottomfish fishing with approximately 49% considering *almost all* their fishing trips in the past 12 months bottomfish trips, with an additional 20% considering *most* of their fishing trips to be primarily bottomfish trips. On average, fishery highliners reported that 73% of their fishing trips were bottomfish trips. Survey respondents from Maui Nui appear to be more reliant on bottomfish resources, averaging 50% of bottomfish trips compared to fishermen from Oahu, Hawaii, and Kauai who average 40%, 32%, and 30%, respectively. Additionally, fishermen who target Deep 7 bottomfish reported a greater percentage of bottomfish trips (45%) compared to those targeting other BMUS or with no particular target species (30%).

Table 13.—Survey Responses: "In the past 12 months, how many of your fishing trips were primarily *bottomfish* trips?"

Percentage of Responses [*n*]	Almost all (90-100%)	Most (60-89%)	Half (40-59%)	Some (10-39%)	Very Few (1-9%)
Full Sample [448]	**18.8**	**11.6**	**16.7**	**24.6**	**28.4**
by County					
Kauai [52]	9.6	7.7	21.2	21.2	40.4
Oahu [184]	19.0	13.0	16.3	26.6	25.0
Maui [91]	31.9	14.3	14.3	16.5	23.1
Hawaii [118]	11.9	9.3	17.8	28.8	32.2
by Classification					
Commercial [414]	18.6	11.4	17.2	24.4	28.5
Highliner [49]	48.9	20.4	14.3	16.3	0.0
Not Highliner [365]	14.5	10.1	17.5	25.5	32.3
Noncommercial [34]	20.6	14.7	11.8	26.5	26.5
By Target					
Deep 7 [275]	21.1	13.8	17.8	25.1	22.2
Other BMUS/None [173]	15.0	8.1	15.0	23.7	38.2

As shown in Table 14, bottomfish fishermen responding to our survey reported an average of 14 bottomfish fishing trips taken in the past 12 months with fishery highliners (40 trips) taking more trips compared to other commercial fishermen (12 trips) and noncommercial permit holders (6 trips). Fishery highliners also spent more time out on the water with an average trip length of 25 hours compared to approximately 10-hour trips taken by other fishermen. Approximately 82% of survey respondents indicated that they trailer the boat on which they fish bottomfish. Nearly 67% of survey respondents reported that they always fish for bottomfish out of the same harbor. Fishery highliners (55%) were most likely to use multiple harbors, while noncommercial permit holders (78%) were most likely to use the same harbor. Likewise, fishery highliners reported the highest-average one-way distance traveled to launch their vessel at 25 miles, relative to the rest of the fishery which averaged approximately 14 miles.

Table 14.--Bottomfish trip characteristics: mean, standard error, and medians.

Variable [*n*]		Full Sample [491]	Highliner [49]	Not Highliner [401]	Noncommercial [41]
Number of bottomfish trips	**Mean**	**14.6**	**40.4**	**12.3**	**6.3**
	Standard error	1.1	5.6	1.1	1.2
	Median	6.3	35.2	6.3	3.1
Trip length (hours)	**Mean**	**11.4**	**25.3**	**9.9**	**9.6**
	Standard error	0.6	2.8	0.5	1.8
	Median	8.0	20.0	8.0	8.0
How many different ramps/ harbors did you use in past 12 months?	**Mean**	**1.5**	**1.8**	**1.5**	**1.4**
	Standard error	0.0	0.2	0.0	0.1
	Median	1.0	1.0	1.0	1.0
Average distance traveled to launch boat (miles, one-way)	**Mean**	**14.9**	**24.8**	**13.7**	**14.3**
	Standard error	0.6	3.2	0.6	2.1
	Median	10.0	20.0	10.0	11.0

We found few differences when considering fishing activity across counties. On average, Maui Nui fishermen reported a slightly higher number of bottomfish trips and Kauai fishermen reported the least amount of travel required to launch their vessel. Otherwise, fishing activity, on average, was comparable across counties (see Table 15).

Table 15.--Bottomfish trip characteristics: mean, standard error, and medians.

Variable [*n*]		Kauai [56]	Oahu [203]	Maui [98]	Hawaii [131]
Number of bottomfish trips	**Mean**	**12.4**	**12.8**	**19.4**	**14.9**
	Standard error	2.1	1.6	2.9	2.3
	Median	6.3	6.3	9.4	3.7
Trip length (hours)	**Mean**	**11.6**	**12.3**	**11.9**	**9.8**
	Standard error	2.7	0.9	0.9	0.9
	Median	6.0	9.0	10.0	8.0
How many different ramps/ harbors did you use in past 12 months?	**Mean**	**1.6**	**1.5**	**1.7**	**1.4**
	Standard error	0.2	0.1	0.1	0.0
	Median	1.0	1.0	1.0	1.0
Average distance traveled to launch boat (miles, one-way)	**Mean**	**10.9**	**16.3**	**13.1**	**15.8**
	Standard error	2.6	0.9	1.2	1.4
	Median	5.0	13.0	10.0	10.0

Nearly all bottomfish fishing trips (89%) in the past 12 months were single day (or night) trips. This finding holds across nearly all subgroups in the fishery with the exception of fishery highliners who reported that approximately 37% of their bottomfish trips were multiday trips (Table 16). In fact, 74% of survey respondents stated that 100% of their bottomfish trips are single day or night trips. Of note, approximately 5% of fishermen reported that all their trips are multi-day trips. Nearly half (45%) of these respondents were Oahu fishermen with the remaining population being equally distributed across other counties, and 41% of these fishermen were fishery highliners.

Table 16.--Survey Responses: "In the past 12 months, what percentage of your *bottomfish* trips were"

Percentage of Trips [*n*]	Single day/ night trips (%)	Multiday trips (%)
Full Sample [463]	**89.0**	**11.0**
by County		
Kauai [51]	89.3	10.7
Oahu [192]	87.4	12.6
Maui [94]	88.0	12.0
Hawaii [123]	92.1	7.9
by Classification		
Commercial [428]	88.4	11.6
Highliner [49]	62.8	37.2
Not Highliner [379]	91.8	8.2
Noncommercial [35]	96.0	4.0
by Target		
Deep 7 [265]	86.1	13.9
Other BMUS/None [163]	92.2	7.8

The MHI bottomfish fishery is subject to regulations that differ across jurisdictional lines, in that spatial closures have been implemented in state waters, and some of these areas overlap with federal waters. Our survey respondents indicated that the majority of bottomfish trips (66%) in the past 12 months were limited to state waters only (Table 17). This behavior varied by county, most clearly explained by bathymetry (Parke, 2008). However, this would also suggest the potential for distributional impacts associated with existing spatial regulations. Nearly all bottomfish fishing effort on the islands of Kauai (87%) and Hawaii (86%) occur exclusively in state waters, whereas fishermen from Oahu and Maui County are more active in federal waters. There are clear differences in spatial behavior across avidity levels and target species. While noncommercial fishers appear to be rather evenly distributed across jurisdictional waters, this distribution is misleading as fishermen are only required to hold noncommercial permits if they fish for BMUS in federal waters. These findings are important as the current noncommercial permit regime, which is limited to effort in Federal waters, is potentially not covering the bulk of noncommercial fishers, as the majority of *commercial* fishing trips occur in state waters.

Table 17.--Survey Responses: "In the past 12 months, what percentage of your *bottomfish* trips did you fish for bottomfish in"

Percentage of Trips [*n*]	State Waters Only (%)	Federal Waters Only (%)	Both State and Federal Waters (%)
Full Sample [460]	**66.2**	**13.5**	**20.2**
by County			
Kauai [52]	87.1	5.3	7.6
Oahu [191]	49.5	25.3	25.2
Maui [91]	63.9	8.2	27.9
Hawaii [123]	85.9	2.8	11.3
by Classification			
Commercial [425]	67.7	12.1	20.2
Highliner [49]	30.4	26.4	43.2
Not Highliner [376]	72.6	10.2	17.2
Noncommercial [35]	48.1	30.5	21.4
by Target			
Deep 7 [279]	58.6	17.2	24.2
Other BMUS/None [181]	77.9	7.8	14.3

While 66% of bottomfish trips in the fishery occurred in state waters, only a slight majority of fishermen (56%) indicated that *all* of their bottomfish trips are limited to state waters only. However, a mere 7% reported the equivalent for federal waters. An additional 15% claimed that all their trips include bottomfish fishing activities in both state and federal waters.

The Hawaii bottomfish fishery consists of a 14-species complex of BMUS; however, the majority of survey respondents (59%) indicated that they primarily target the Deep 7 bottomfish complex. Approximately a quarter of survey respondents (24%) expressed that they primarily targeted other BMUS species and 17% indicated no particular target when bottomfish fishing. Fishery highliners target the high-value Deep 7 species almost exclusively (92%). Fishermen who were active in the most recent fishing season also tended to target Deep 7 species compared to those who were not active in the most recent year (see Table 18).

Table 18.--Survey Responses: "When you fish for bottomfish do you primarily target?" (please check one)"

Percentage of Responses [*n*]	Deep 7 Bottomfish	Other BMUS	No Target
Full Sample [492]	**58.7**	**24.4**	**16.9**
by County			
Kauai [55]	52.7	25.5	21.8
Oahu [204]	54.4	27.5	18.1
Maui [98]	61.2	29.6	9.2
Hawaii [132]	65.9	15.9	18.2
by Classification			
Commercial [450]	60.0	24.9	15.1
Highliner [49]	91.8	2.0	6.1
Not Highliner [401]	56.1	27.7	16.2
Noncommercial [42]	45.2	19.1	35.7
by Fished in most recent season			
Yes [432]	61.6	25.2	13.2
No [60]	38.3	18.3	43.3

Fishermen were asked to account for their bottomfish landings in the past 12 months for both Deep 7 bottomfish and for other BMUS catch. As providing the exact catch totals was not a priority for this survey and to assuage recall bias and confidentiality concerns, fishermen were given broad catch bins so we could generally understand catch levels within the fleet. We also asked fishermen to report Deep 7 bottomfish and other BMUS catch separately. The distribution of catch totals for subgroups of the fishery are presented in Tables 19 and 20.

Clearly, by definition, 100% of fishery highliners reported more than 1000 pounds of Deep 7 bottomfish caught in the past 12 months. However, within this group, the majority (65%) fall in the 1001–2500 pound catch bin, with only 35% reporting more than 2500 pounds of Deep 7 bottomfish. When looking at other BMUS fish caught by fishery highliners, evidence shows that these fishermen prefer to target Deep 7 bottomfish, as less than half (43%) of highliners reported catch more than 1000 pounds for other BMUS. Maui fishermen tend to land a greater amount of Deep 7 bottomfish compared to other counties, whereas both Maui and Kauai fishermen reported higher landings of other BMUS, on average.

Table 19.--Survey Responses: "In the past 12 months approximately how many total pounds of *Deep 7 bottomfish* did **you** catch?"

Percentage of Responses [*n*]	None	1-50 pounds	51-100 pounds	101-500 pounds	501-1000 pounds	1001-2500 pounds	More than 2500 pounds
Full Sample [500]	**1.0**	**44.0**	**13.2**	**23.6**	**8.4**	**6.4**	**3.4**
by County							
Kauai [56]	0.0	48.2	14.3	26.8	3.6	1.8	5.4
Oahu [207]	0.9	46.9	14.9	20.8	9.2	5.8	1.4
Maui [98]	1.0	38.8	7.1	22.5	8.2	12.2	10.2
Hawaii [136]	1.5	41.9	14.7	16.5	9.6	5.2	0.7
by Classification							
Commercial [458]	1.1	41.5	12.9	24.9	8.9	6.9	3.7
Highliner [49]	0.0	0.0	0.0	0.0	0.0	65.3	34.7
Not Highliner [409]	1.2	46.5	14.4	27.9	10.0	0.0	0.0
Noncommercial [42]	17.0	54.0	17.0	10.0	2.0	0.0	0.0
by Target							
Deep 7 [289]	0.0	22.2	14.5	34.6	13.2	9.7	5.9
Other BMUS/None [211]	2.4	73.9	11.4	8.5	1.9	1.9	0.0
by Fished in most recent season							
Yes [434]	0.7	39.4	14.3	25.6	9.5	6.9	3.7
No [66]	3.0	74.2	6.1	10.6	1.5	3.0	1.5

Table 20.--Survey Responses: "In the past 12 months approximately how many total pounds of other bottomfish did **you** catch?"

Percentage of Responses [*n*]	None	1-50 pounds	51-100 pounds	101-500 pounds	501-1000 pounds	1001-2500 pounds	More than 2500 pounds
Full Sample [500]	**1.4**	**43.2**	**16.4**	**22.8**	**8.6**	**3.8**	**3.8**
by County							
Kauai [56]	1.8	35.7	14.3	19.6	16.1	5.4	7.1
Oahu [207]	0.9	46.4	13.5	26.6	6.3	2.9	3.4
Maui [98]	0.0	35.7	18.4	25.5	8.2	7.1	5.1
Hawaii [136]	2.9	46.3	20.6	16.2	9.6	2.2	2.2
by Classification							
Commercial [458]	1.5	41.1	16.2	23.8	9.2	4.2	4.2
Highliner [49]	0.0	6.1	14.3	26.5	10.2	18.4	24.5
Not Highliner [409]	1.7	45.2	16.4	23.5	9.1	2.4	1.7
Noncommercial [42]	0.0	66.7	19.1	11.9	2.4	0.0	0.0
by Target							
Deep 7 [289]	1.0	44.9	17.3	21.5	7.6	4.5	3.1
Other BMUS/None [211]	1.9	40.8	15.2	24.6	9.9	2.8	4.7
by Fished in most recent season							
Yes [434]	1.2	39.2	17.8	24.2	9.5	4.2	4.2
No [66]	3.0	69.7	7.6	13.6	3.0	1.5	1.5

Based on the large catch bin categories used in the survey, average catch totals for our survey respondents will not be shown, but using official State of Hawaii catch reports for commercially licensed bottomfish fishermen landing Deep 7 bottomfish we find that our survey respondents were no different than non-respondents (see Table 21). However, it is clear that there are distinct differences in landings by avidity within the commercially licensed subgroup of the fishery. Annual landing averages and per-trip totals using official State of Hawaii catch reports are presented in Table 22.

Table 21.--Distribution of Deep 7 fleet landings in the past 12 months: State of Hawaii catch reports and survey respondents, by county.

Deep 7 Pounds Caught (lb)	Kauai	Survey Respondents	Oahu	Survey Respondents	Maui	Survey Respondents	Hawaii	Survey Respondents
0 – 50	30.4	34.2	28.8	27.1	14.4	11.1	33.7	34.0
51 – 100	12.5	10.5	14.1	14.0	8.7	7.9	10.9	12.0
101 – 500	42.9	36.8	34.4	37.4	27.9	28.6	34.9	37.0
501 – 1000	8.9	10.5	12.3	9.3	18.3	19.0	10.9	10.0
1001 – 2500	1.8	2.6	7.4	7.5	20.2	19.0	6.3	5.0
Greater than 2500	3.6	5.3	3.1	4.7	10.6	14.3	3.4	2.0

Source: State of Hawaii (2011): Fisher Reporting System (April 2009–April 2010)

Table 22.--Pounds caught in past 12 months for CML fishermen: means, standard errors, and medians.

Variable [*n*]		CML Population [782]	Survey Sample [421]	Highliner [45]	Not Highliner [375]
Annual pounds caught					
Total BMUS pounds caught	**Mean**	**605**	**700**	**3932**	**314**
	Standard error	49	79	456	35
	Median	153	167	3025	135
Deep 7 pounds	**Mean**	**371**	**467**	**3181**	**143**
	Standard error	38	63	402	11
	Median	40	63	2255	42
Trip-level pounds caught					
BMUS Pounds per trip	**Mean**	**67**	**67**	**194**	**49**
	Standard error	4	5	32	3
	Median	40	39	112	33

Source: State of Hawaii (2011): Fisher Reporting System (April 2009–April 2010)

Market Participation and Access

During 2009 and 2010, the MHI bottomfish fishery was valued at approximately $2.09 million and $1.70 million, respectively (State of Hawaii, 2011). The Deep 7 bottomfish species are some of the highest valued species in the Hawaii seafood market. The average price for Deep 7 bottomfish during 2010 was approximately $5.93 per pound, Uku (gray snapper), a popular non-Deep 7 bottomfish was approximately $3.94 per pound, whereas other BMUS fish averaged $1.79 per pound (State of Hawaii, 2011).

There is clearly an economic incentive for fishery participants. However, we found that 21% of commercially licensed bottomfish fishermen *had not sold any* bottomfish catch in the past 12 months. On the other end of the spectrum, we found only 5% reporting that they sold all the bottomfish they caught. Aside from noncommercial permit holders (92%), fishermen that target other BMUS or no particular target species were the subgroup with the highest percentage (26%) of fishermen reporting no sales of bottomfish in the past 12 months. We found little difference across counties of CML fishermen reporting no sales of bottomfish. Oahu reported having the highest percentage (24%), followed by Maui Nui (21%), and both Hawaii and Kauai reported having the

lowest percentage (19%) of fishermen not selling bottomfish in the past 12 months. For the majority of the fleet there is considerable heterogeneity in market participation and access. The average percentage of bottomfish sold in the past 12 months, based on survey responses for subgroups of the Hawaii bottomfish fleet, are presented in Table 23. The distribution of survey responses is presented in Table 24.

Table 23.--Survey Responses: Percentage of bottomfish sold (all responses).

Percentage sold [*n*]	**Mean (%)**	**St.error**	**median**
Full Sample [480]	**39.9**	**1.7**	**39.5**
by County			
Kauai [53]	39.7	4.8	39.0
Oahu [203]	34.6	2.5	19.0
Maui [95]	42.2	3.8	50.0
Hawaii [126]	46.9	3.4	53.5
by Classification			
Highliner [48]	78.0	3.1	90.0
Not Highliner [394]	39.0	1.8	35.0
by Target			
Deep 7 [264]	47.4	2.2	53.5
Other BMUS/None [178]	37.1	2.7	24.5

Table 24.--Distribution of survey responses: Percentage of bottomfish sold (all responses).

Percentage of Responses [*n*]	Almost All (90%-100%)	Most (60%-89%)	About Half (40%-59%)	Some (10%-39%)	Very Little (1%-9%)	None
Full Sample [493]	**17.5**	**20.6**	**11.9**	**13.3**	**9.8**	**26.9**
by County						
Kauai [53]	16.9	15.1	16.9	18.9	11.3	20.8
Oahu [203]	13.3	19.7	12.3	11.3	9.4	33.9
Maui [95]	21.1	17.9	13.7	10.5	11.6	25.3
Hawaii [126]	22.2	25.4	7.9	16.7	7.9	19.8
by Classification						
Commercial [442]	19.0	22.2	12.9	14.5	10.2	21.3
Highliner [48]	54.2	27.1	14.6	4.2	0.0	0.0
Not Highliner [394]	14.7	21.6	12.7	15.7	11.4	23.9
Non Commercial [38]	0.0	2.6	0.0	0.0	5.3	92.1
by Target						
Deep 7 [281]	20.6	22.4	12.5	14.9	6.8	22.8
Other BMUS/None [199]	13.1	18.1	11.1	11.1	14.1	32.7

As exact pounds sold and revenues totals were not a priority for this survey, and to assuage recall bias and confidentiality concerns, fishermen were given broad percentage bins so we could generally understand market participation within the fleet. The average pounds sold of total BMUS, Deep 7 bottomfish, and gross revenues using official State of Hawaii dealer reports are presented in Table 25. Again, we find that our survey respondents are representative of the survey population.

Table 25.--Market participation in past 12 months: means, standard errors, and medians.

Variable [*n*]		CML Population* [782]	Survey Sample* [419]	Highliner* [44]	Not Highliner* [375]
Pounds Sold, BMUS	**Mean**	**459**	**532**	**3401**	**194**
	Standard error	44	72	428	34
	Median	52	52	2384	31
Pounds Sold, Deep 7	**Mean**	**287**	**366**	**2729**	**84**
	Standard error	33	57	379	9
	Median	0.0	1.3	1810	0.0
Gross revenue (dollars)	**Mean**	**2206**	**2830**	**19,440**	**845**
	Standard error	233	406	2566	124
	Median	192	180	14,697	121
Revenue per trip	**Mean**	**304**	**322**	**921**	**197**
	Standard error	24	32	139	16
	Median	169	169	699	119
Average Price (all BMUS)	**Mean**	**4.75**	**4.92**	**5.89**	**4.71**
	Standard error	0.09	0.11	0.13	0.13
	Median	4.68	4.91	5.76	4.50

*Limited to fishermen who sold bottomfish in past 12 months.
Source: State of Hawaii Fisher Reporting System (April 2009–April 2010)

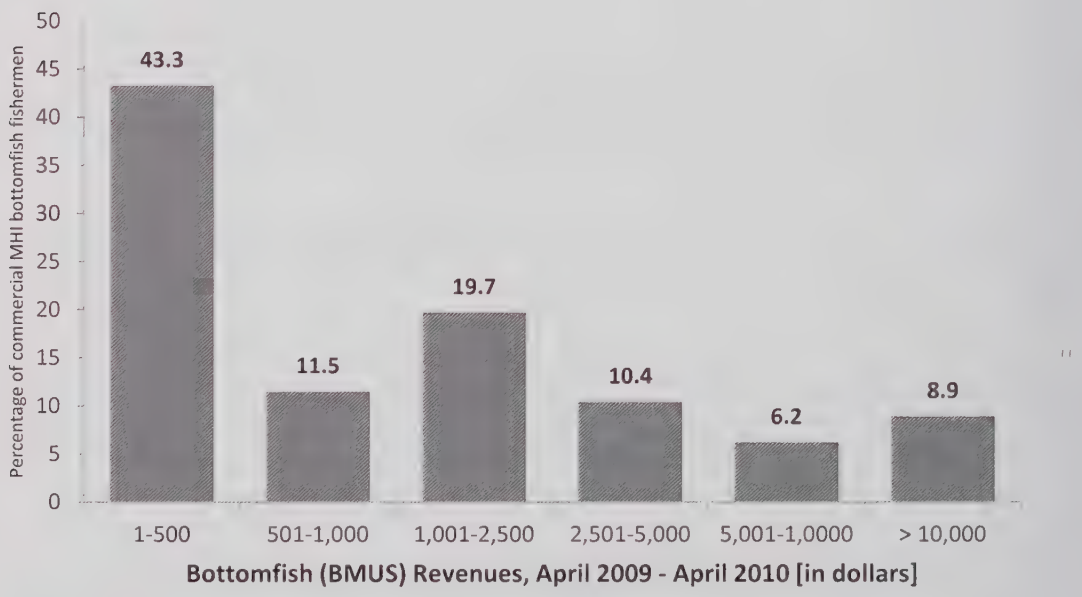

Figure 1.--Distribution of gross revenues, State of Hawaii Dealer Reports.
Source: State of Hawaii (2011)

Fishermen in the MHI bottomfish fleet reported a moderate reliance on fishing as a source of personal income. On average, across the fleet, using the medians of survey response categories, fishermen reported approximately 19% of personal income from the sale of fish. However, if we strictly consider those who reported the sale of

bottomfish in the past 12 months, we find an average of 27% of personal income from fishing (see Table 26). As one would expect, fishery highliners are much more reliant on fishing as a source of income, as approximately 50% of their personal income is derived from fishing, compared to 22% for other commercially licensed fishermen. The distribution of fishing income is presented in Table 27.

Table 26.--Survey Responses: "In the past 12 months, what percent of your personal income came from fishing?" *(for those who sold bottomfish).*

Percentage personal income [*n*]	**Mean (%)**	**St.error**	**median**
Full Sample [348]	**26.9**	**1.6**	**25.0**
by County			
Kauai [42]	27.9	4.4	25.0
Oahu [133]	21.9	2.5	5.0
Maui [70]	29.6	3.6	25.0
Hawaii [101]	31.3	3.2	25.0
by Classification			
Highliner [48]	50.4	4.4	50.0
Not Highliner [300]	22.9	1.6	5.0
by Target			
Deep 7 [216]	28.4	2.1	25.0
Other BMUS/None [132]	24.4	2.5	5.0

Table 27.--Survey Responses: "In the past 12 months, what percent of your personal income came from fishing?" *(for those who sold bottomfish).*

Percentage of Responses [n]	Almost All (90%-100%)	Most (60%-89%)	About Half (40%-59%)	Some (10%-39%)	Very Little (1%-9%)	None
Full Sample [341]	**10.3**	**5.3**	**9.7**	**27.3**	**40.8**	**6.7**
by County						
Kauai [39]	7.7	7.7	12.8	35.9	33.3	2.6
Oahu [131]	9.2	3.1	6.9	21.4	51.2	8.4
Maui [69]	10.1	7.3	8.7	36.2	31.9	5.8
Hawaii [100]	13.0	6.0	13.0	26.0	35.0	7.0
by Classification						
Highliner [48]	25.0	6.3	29.2	31.3	8.3	0.0
Not Highliner [293]	7.9	5.1	6.5	26.6	46.1	7.9
by Target						
Deep 7 [212]	10.9	6.1	10.4	26.9	41.5	4.3
Other BMUS/None [129]	9.3	3.9	8.5	27.9	39.5	10.9

While the majority of survey respondents (56%) considered bottomfish to have *very little* or *no* contribution to their annual fishing income, for those who reported the sale of bottomfish, on average, nearly a quarter (24%) of fishing income is a result of bottomfish fishing. Fishery highliners rely more on bottomfish revenues (59% of fishing income) than other commercially licensed fishermen (19%). On average, survey respondents reported that 24% of fishing revenues are derived from bottomfish. Maui fishermen had the highest reliance, an average of 33% of fishing revenues from bottomfish. Kauai (22%) and Hawaii (25%) fishermen also reported moderate reliance on bottomfish yields. Oahu fishermen showed the least reliance, an average of 20%, from bottomfish income. Estimates of bottomfish as a share of fishing income are presented in Table 28, and the distribution of survey responses is presented in Table 29.

Table 28.--Mean Survey Responses: "In the past 12 months, what percent of your fishing income came from *bottomfish* fishing?" *(for those who sold bottomfish)*

	Mean (%)	St.error	median
Full Sample [348]	**24.3**	**1.61**	**5.0**
by County			
Kauai [39]	21.9	4.4	5.0
Oahu [133]	19.5	2.4	5.0
Maui [70]	33.1	4.2	25.0
Hawaii [101]	24.9	2.9	5.0
by Classification			
Highliner [48]	59.2	4.6	50.0
Not Highliner [300]	18.7	1.5	5.0
by Target			
Deep 7 [216]	26.7	2.1	5.0
Other BMUS/None [132]	20.3	2.5	5.0

Table 29.--Survey Responses: "In the past 12 months, what percent of your fishing income came from *bottomfish* fishing?" *(for those who sold bottomfish)*

Percentage of Responses [n]	Almost All (90%-100%)	Most (60%-89%)	About Half (40%-59%)	Some (10%-39%)	Very Little (1%-9%)	None
Full Sample [342]	**9.4**	**6.1**	**7.3**	**20.8**	**46.8**	**9.7**
by County						
Kauai [40]	7.5	5.0	10.0	17.5	55.0	5.0
Oahu [131]	6.1	6.1	4.6	17.6	54.2	11.5
Maui [69]	17.4	7.3	7.3	26.1	30.4	11.6
Hawaii [100]	8.0	6.0	10.0	23.0	45.0	8.0
by Classification						
Highliner [48]	33.3	14.6	20.8	22.9	8.3	0.0
Not Highliner [294]	5.4	4.8	5.1	20.4	53.1	11.2
by Target						
Deep 7 [213]	10.3	7.0	7.9	22.5	46.5	5.6
Other BMUS/None [129]	7.8	4.7	6.2	17.8	47.3	16.3

Distinct market channels are available to fishermen across the state. The high demand for fresh local fish allows Hawaii's fishermen a number of viable outlets to market their catch. For example, a daily fresh fish auction in Honolulu, managed by the United Fishing Agency (UFA), allows anyone holding a valid commercial marine license to drop their catch off and it will be sold for them. Numerous dealers and wholesalers across the state specialize in seafood distribution where fishermen can sell their fish directly (Pooley, 1986). Many markets and stores sell local fish and there is high demand at restaurants catering to tourists and residents alike. Other avenues to sell fish include word of mouth through friends, neighbors, or coworkers, and some fishermen even directly market their catch on the side of the road. Based on our survey respondents, we find that nearly a third (33%) of bottomfish is sold directly to dealers and wholesalers while 26% is sold at auction and 21% is sold directly to markets and stores.

Average distributions by market channel, as reported by survey respondents are presented in Table 30, and the percentage of respondents that reported using each particular market outlet by county is presented in Table 31. On average, a majority of Oahu bottomfish is

sold directly to the UFA auction, while significantly less neighbor island bottomfish makes it to auction. More than any other county, Hawaii fishermen sell the majority of their bottomfish (67%) to dealers and wholesalers, whereas Maui and Kauai fishermen rely heavily on dealers and wholesalers, markets and stores and restaurants. Additionally, a larger percentage of survey respondents on Maui and Kauai reported roadside sales.

Table 30.--Survey Responses: "Where do you sell your *bottomfish* catch?"

Percentage of Bottomfish [*n*]	UFA Auction (%)	Dealer/ Wholesaler (%)	Markets/ Stores (%)	Restaurants (%)	Friends/ Neighbors/ Coworkers (%)	Roadside (%)	Other (%)
Full Sample* [347]	**26.2**	**33.4**	**20.5**	**9.9**	**8.2**	**1.6**	**0.4**
by County							
Kauai [42]	7.9	26.6	19.1	26.3	15.3	4.7	0.0
Oahu [132]	59.3	11.9	17.9	2.0	7.7	0.8	0.3
Maui [70]	7.1	28.7	27.1	20.7	12.6	3.7	0.0
Hawaii [101]	3.2	67.2	20.3	6.3	2.9	0.1	1.0
by Classification							
Highliner [48]	41.8	31.0	12.0	10.8	2.6	1.7	0.0
Not Highliner [299]	23.6	33.8	21.9	9.8	9.0	1.6	0.5
by Target							
Deep 7 [216]	32.7	35.5	15.3	10.7	5.2	0.5	0.6
Other BMUS/None [131]	15.5	29.9	29.1	8.8	12.9	3.6	0.0

* Limited to fishermen who sold bottomfish in past 12 months.

Table 31.--Market Access: percentage of respondents using outlet, by county.

Market Outlet [*n*]	**Full sample*** [347]	Kauai [42]	Oahu [132]	Maui [70]	Hawaii [101]
Auction	**34.9**	14.3	75.8	10.0	6.9
Dealer/Wholesaler	**51.6**	45.2	31.1	50.0	82.2
Market/Store	**42.9**	40.5	36.4	62.9	39.6
Restaurant	**27.4**	47.6	12.1	54.3	20.8
Friends/neighbors/coworkers	**25.6**	28.6	24.2	44.3	13.9
Roadside Sales	**6.4**	11.9	1.5	18.6	1.9
Other	**0.6**	0.0	0.8	0.0	1.0

*Limited to fishermen who sold bottomfish in past 12 months.

We have shown that market participation varies by fishermen and geography. It would appear that fishermen also use a diversity of market outlets, as half the fishery (50%) reported using more than one market outlet in the past 12 months, either by choice or by necessity. For the purpose of this report, we simply consider market outlets as defined in Table 31. We do not have a distinction as to how many *different* markets or stores one may sell to, but we consider markets and stores as one market outlet. Hawaii (59%) and Oahu (54%) fishermen were more likely to use a single market outlet compared to Kauai (45%) and Maui (30%) fishermen (Table 32).

Table 32.--Market Access: percentage of respondents using different outlets, by county.

Number of Different Market Outlets Utilized [*n*]	**Full sample*** [347]	Kauai [42]	Oahu [132]	Maui [70]	Hawaii [101]
One	**49.7**	45.2	53.8	30.0	59.4
Two	**27.0**	30.9	26.6	31.4	23.8
Three	**10.9**	16.7	8.3	14.3	9.9
Four	**9.8**	4.8	9.0	20.0	5.9
Five	**2.3**	2.4	2.3	4.3	0.9

*Limited to fishermen who sold bottomfish in past 12 months.

While fishermen across the State of Hawaii face different market access challenges, there do not appear to be significant market limitations for MHI bottomfish fishermen. Nearly 88% indicated that they do not have difficulties selling their bottomfish catch. Highliners appear to have well established market relationships, as 94% confirmed that they were able to sell all the catch they wanted to sell. Based on the market access findings above, it may not be surprising that Kauai (15%) and Maui (12%) fishermen had the most difficulty selling their catch. On average, these fishermen also reported using the most market outlets and participated in the highest levels of roadside sales which may have been viewed as a potential last resort option or a desired option if market prices are low.

Table 33.--Survey Responses: "Can you usually sell all of your fish if you want to?"

Percentage of Respondents [*n*]	Yes (%)	No (%)	Don't Know (%)
Full Sample* [342]	**87.7**	**8.2**	**4.1**
by Classification			
Highliner [48]	93.8	6.2	0.0
Not Highliner [294]	86.7	8.5	4.8
by County			
Kauai [40]	80.0	15.0	5.0
Oahu [131]	89.3	5.3	5.3
Maui [69]	82.6	11.6	5.8
Hawaii [100]	92.0	7.0	1.0
by Target			
Deep 7 [212]	92.5	6.6	0.9
Other BMUS/None [130]	80.0	10.8	9.2

*Limited to fishermen who sold bottomfish in past 12 months.

The survey included an open-ended probe for survey respondents who felt that they could not usually sell all of the fish they would have liked to sell. Most respondents used the opportunity to elucidate reasons why. A majority (55%) cited market conditions as limiting their ability to sell their catch, with a nearly even split between prices being too low to warrant sales or that the market was at capacity and/or not buying. Additional reasons cited included the catch of undesirable/nontarget species (13%), the fish being too small (8%), and others gave no particular reason (24%).

Given the significant institutional change brought on by total allowable catch (TAC) management in 2006, we sought to understand fishermen's perceptions on market prices in recent years. Despite declines in real (inflation-adjusted) ex-vessel prices for Deep 7

species since 2006 (Hospital and Pan, 2009), a majority of survey respondents (51%) consider prices they receive for bottomfish catch to be about the same as before TAC management was implemented. Additionally, a number of fishermen (22%) indicated that they did not know, which would suggest that profit and revenues may not be a high priority for these fishermen. Approximately 67% of fishery highliners perceived no major changes in bottomfish prices with the imposition of TAC management.

Table 34.--I feel the prices I receive for bottomfish are?

Percentage of Respondents [*n*]	Higher than before TAC (%)	About the same (%)	Lower than before TAC (%)	Don't Know (%)
Full Sample* [341]	5.9	50.7	21.4	21.9
by County				
Kauai [40]	2.5	60.0	17.5	20.0
Oahu [130]	8.5	40.0	23.1	28.5
Maui [68]	5.9	61.8	19.1	13.2
Hawaii [101]	3.9	52.5	22.8	20.8
by Classification				
Highliner [48]	0.0	66.7	27.1	6.3
Not Highliner [293]	6.8	48.1	20.5	24.6
by Target				
Deep 7 [213]	3.8	57.8	23.0	15.5
Other BMUS/None [128]	9.4	39.1	18.8	32.8

*Limited to fishermen who sold bottomfish in past 12 months.

Trip Costs

This section presents a snapshot of trip costs incurred for bottomfish fishing trips during 2009 and 2010. Fishermen surveyed were asked for the month and year of their most recent fishing trip to prompt recall and then asked to detail trip-related expenditures for their most recent bottomfish fishing trip. For bottomfish trips taken in 2009 and 2010, the average trip cost approximately $212. As one may expect, fuel expenses were the largest contributor to total trip expenditures. The average bottomfish trip cost $100 for boat fuel and $19 for truck fuel, leading fuel costs to account for a majority (56%) of total trip expenditures. Bait was the next largest contributor to total trip costs at $32 (15%). On average, commercially licensed fishermen spent a larger percentage on ice than noncommercial permit fishermen, and noncommercial permit fishermen spent a larger percentage on food and beverage than commercially licensed fishermen.

Table 35.--Most recent bottomfish fishing trip costs: means, standard errors, and medians.

Variable [*n*]		Full Sample [435]		Commercial Highliner [48]		Commercial Not Highliner [359]		Noncommercial [28]	
		$ per trip	% of total trip cost	$ per Trip	% of total trip cost	$ per trip	% of total trip cost	$ per trip	% of total trip cost
Boat Fuel	**Mean**	**100.28**	47.3	**150.25**	41.3	**95.38**	48.2	**77.53**	60.4
	Standard error	4.25		15.05		4.50		13.67	
	Median	80.00		123.50		70.00		50.00	
Truck Fuel	**Mean**	**18.97**	9.0	**20.38**	5.6	**19.66**	9.9	**7.75**	6.0
	Standard error	0.85		1.94		0.97		1.43	
	Median	15.00		20.00		15.00		6.50	
Ice	**Mean**	**27.99**	13.2	**61.10**	16.8	**24.79**	12.5	**12.14**	9.5
	Standard error	1.65		9.13		1.39		3.73	
	Median	20.00		45.00		20.00		8.00	
Bait	**Mean**	**32.11**	15.2	**77.42**	21.3	**27.44**	13.9	**14.29**	11.1
	Standard error	2.05		10.78		1.79		3.13	
	Median	20.00		50.00		20.00		10.00	
Food and Beverage	**Mean**	**25.29**	11.9	**36.67**	10.1	**24.51**	12.4	**15.89**	12.4
	Standard error	1.96		3.95		2.29		3.11	
	Median	20.00		30.00		20.00		12.50	
Other Daily Costs (oil, gear, etc.)	**Mean**	**7.25**	3.4	**18.33**	5.0	**6.28**	3.2	**0.71**	0.6
	Standard error	1.50		6.58		1.57		0.71	
	Median	0.00		0.00		0.00		0.00	
Total Trip Cost	**Mean**	**211.90**		**364.15**		**198.07**		**128.32**	
	Standard error	8.88		37.53		8.82		21.46	
	Median	160.00		300.00		151.00		102.50	

On average, Oahu fishermen's fuel costs are slightly higher compared to neighbor island fishermen. While the average trip cost for Kauai fishermen is the highest of all counties, this is in large part attributed to a few recent high-cost multi-day trips taken by Kauai fishermen as the median trip cost is actually the lowest of all counties in the state.

Table 36.--Most recent bottomfish fishing trip costs: means, standard errors, and medians.

Variable [*n*]		Kauai [47]		Oahu [177]		Maui [87]		Hawaii [121]	
		$ per trip	% of total trip cost	$ per trip	% of total trip cost	$ per trip	% of total trip cost	$ per trip	% of total trip cost
Boat Fuel	**Mean**	**112.81**	45.7	**105.48**	50.0	**102.99**	44.5	**86.21**	46.1
	Standard error	19.60		6.49		8.45		6.83	
	Median	50.00		90.00		85.00		60.00	
Truck Fuel	**Mean**	**16.15**	6.5	**17.38**	8.2	**19.51**	8.4	**22.19**	11.9
	Standard error	2.54		1.16		1.85		1.89	
	Median	10.00		15.00		20.00		15.00	
Ice	**Mean**	**47.32**	19.2	**24.77**	11.7	**31.87**	13.8	**22.60**	12.1
	Standard error	9.46		1.78		4.25		2.03	
	Median	20.00		20.00		20.00		15.00	
Bait	**Mean**	**43.19**	17.5	**28.04**	13.3	**42.10**	18.2	**26.55**	14.2
	Standard error	9.67		2.15		6.59		2.69	
	Median	15.00		20.00		21.00		20.00	
Food and Beverage	**Mean**	**24.59**	10.0	**27.79**	13.2	**27.75**	12.0	**20.61**	11.0
	Standard error	4.15		4.22		2.52		2.42	
	Median	15.00		20.00		20.00		15.00	
Other Daily Costs (oil, gear, etc.)	**Mean**	**2.87**	1.2	**7.41**	3.5	**7.33**	3.2	**8.84**	4.7
	Standard error	1.71		2.83		2.74		2.74	
	Median	0.00		0.00		0.00		0.00	
Total Trip Cost	**Mean**	**246.94**		**210.88**		**231.55**		**187.02**	
	Standard error	39.28		12.77		21.13		14.21	
	Median	120.00		175.00		190.00		145.00	

Annual Fishing Expenditures

In addition to variable trip costs, fishing in Hawaii requires significant annual fixed-cost expenditures. A detailed accounting of annual expenditures as reported by survey respondents is presented in Table 37. This table presents fleet-level averages for major expenditure categories and also reports the prevalence each expenditure category noted in the table. Nearly every survey respondent (97%) reported fishing-related expenditures during 2009. The categories with the highest percentage of fishermen reporting expenditures were repair and maintenance (93%), fees (92%), fishing gear (90%), oil and lube (88%), and safety equipment (60%). Repair and maintenance was also the category with the highest expenditure in 2009, followed by gear expenditures. For the remainder of expenditure categories, the majority of fishermen reported no expenditures during 2009. On average, survey respondents reported approximately $8,211 in fishing-related expenditures with a median expenditure of $4,875. Fishery highliners incurred higher levels of expenditures with an average of $14,186 and a median expenditure of $9,273. As annual fishing expenditures can vary dramatically, it is advised that one considers median expenditures when noting differences among subgroups in the fishery. While we find no significant difference across counties, county-level expenditures are presented in Table 38. For a more accurate accounting of true out-of-pocket expenditures, see Table 39 which presents average expenditures limited to fishermen reporting a non-zero expenditure for each category.

Table 37.--Annual fishing expenditures in 2009: means, standard errors, and medians.

Variable [*n*]	% of fleet with expenditure		Full Sample [437]	Commercial Highliner [48]	Commercial Not Highliner [360]	Noncommercial [29]
Boat insurance	38.2	**Mean**	**380**	**679**	**345**	**321**
		Standard error	45	240	43	94
		Median	0	0	0	0
Loan payments on the boat	26.9	**Mean**	**809**	**579**	**885**	**255**
		Standard error	129	304	151	188
		Median	0	0	0	0
Financial svcs.: bookkpng/acctg	33.4	**Mean**	**197**	**611**	**157**	**9**
		Standard error	36	246	28	9
		Median	0	100	0	0
Moorage Fees	18.1	**Mean**	**254**	**548**	**213**	**293**
		Standard error	39	191	37	181
		Median	0	0	0	0
Repair, Maint. for vessel, engines, or trailer	92.7	**Mean**	**3247**	**6068**	**2904**	**2842**
		Standard error	319	2023	260	1137
		Median	1200	2100	1000	500
Oil and Lube	87.9	**Mean**	**320**	**583**	**307**	**56**
		Standard error	30	141	31	18
		Median	150	372	150	25
Gear	89.7	**Mean**	**1544**	**2654**	**1485**	**447**
		Standard error	122	499	129	185
		Median	600	1350	539	100
Electronics	41.0	**Mean**	**702**	**1303**	**646**	**400**
		Standard error	95	482	95	196
		Median	0	0	0	0
Fees	92.0	**Mean**	**306**	**347**	**311**	**176**
		Standard error	21	39	25	45
		Median	200	300	200	75
Safety Equipment	60.2	**Mean**	**187**	**460**	**157**	**112**
		Standard error	19	112	16	41
		Median	50	100	50	0
Other	8.8	**Mean**	**264**	**304**	**279**	**0**
		Standard error	80	159	94	0
		Median	0	0	0	0
Annual fishing expenditures in 2009	97.3	**Mean**	**8211**	**14,136**	**7687**	**4911**
		Standard error	493	2422	478	1358
		Median	4875	9273	4580	1700

Table 38.--Annual fishing expenditures in 2009: means, standard errors, and medians.

Variable [*n*]		Kauai [49]	Oahu [175]	Maui [90]	Hawaii [120]
Boat insurance	**Mean**	**274**	**463**	**507**	**216**
	Standard error	108	64	154	52
	Median	0	50	0	0
Loan payments	**Mean**	**997**	**632**	**1366**	**595**
on the boat	Standard error	408	155	446	174
	Median	0	0	0	0
Financial svcs.:	**Mean**	**168**	**231**	**249**	**126**
bookkpng/acctg	Standard error	40	76	88	23
	Median	0	0	0	0
Moorage Fees	**Mean**	**183**	**347**	**239**	**168**
	Standard error	85	85	62	42
	Median	0	0	0	0
Repair, Maint.	**Mean**	**2724**	**3013**	**4007**	**3210**
for vessel, engs.,	Standard error	848	375	1108	493
or trailer	Median	1000	1138	1500	1000
Oil and Lube	**Mean**	**468**	**354**	**277**	**252**
	Standard error	152	52	39	38
	Median	150	200	175	105
Gear	**Mean**	**2034**	**1357**	**1414**	**1749**
	Standard error	388	179	292	237
	Median	1,000	500	500	900
Electronics	**Mean**	**621**	**713**	**541**	**809**
	Standard error	189	125	187	246
	Median	0	0	0	0
Fees	**Mean**	**373**	**323**	**263**	**285**
	Standard error	94	34	23	41
	Median	160	208	200	200
Safety	**Mean**	**194**	**186**	**228**	**160**
Equipment	Standard error	68	31	45	29
	Median	35	55	90	50
Other	**Mean**	**81**	**143**	**301**	**490**
	Standard error	60	55	260	200
	Median	0	0	0	0
Annual fishing	**Mean**	**8115**	**7761**	**9393**	**8061**
expenditures in	Standard error	1423	693	1476	800
2009	Median	5265	4600	5005	4988

Table 39.--Annual fishing expenditures in 2009 (non-zero expenditures): means, standard errors, and medians.

Variable [*n*]		Full Sample	Commercial Highliner	Commercial Not Highliner	Noncommercial
		[169]	[21]	[137]	[11]
Boat insurance	**Mean**	**989**	**1552**	**915**	**847**
	Standard error	100	491	96	145
	Median	600	1000	600	800
		[74]	[5]	[67]	[2]
Loan payments	**Mean**	**4780**	**4189**	**4754**	
on the boat	Standard error	575	1873	621	conf.
	Median	3720	5000	3600	
		[148]	[26]	[121]	[1]
Financial svcs.:	**Mean**	**583**	**1128**	**469**	
bookkpng/	Standard error	99	432	77	conf.
acctg	Median	290	400	260	
		[80]	[15]	[61]	[4]
Moorage Fees	**Mean**	**1419**	**1753**	**1291**	**2124**
	Standard error	163	492	166	961
	Median	1150	1200	1000	1722
		[409]	[46]	[341]	[22]
Repair, Maint.	**Mean**	**3480**	**6332**	**3079**	**3747**
for vessel, engs.,	Standard error	338	2103	271	1454
or trailer	Median	1500	2350	1200	1000
		[388]	[46]	[324]	[18]
Oil and Lube	**Mean**	**364**	**608**	**344**	**90**
	Standard error	33	146	33	25
	Median	200	400	200	68
		[395]	[48]	[330]	[17]
Gear	**Mean**	**1722**	**2654**	**1636**	**762**
	Standard error	133	499	139	295
	Median	800	1350	800	300
		[181]	[23]	[151]	[7]
Electronics	**Mean**	**1706**	**2719**	**1554**	**1657**
	Standard error	209	928	204	631
	Median	1000	700	1000	1500
		[406]	[47]	[339]	[20]
Fees	**Mean**	**332**	**355**	**334**	**255**
	Standard error	22	39	26	57
	Median	250	300	240	150
		[264]	[34]	[220]	[10]
Safety	**Mean**	**318**	**650**	**267**	**326**
Equipment	Standard error	30	147	26	86
	Median	138	475	100	300
		[36]	[5]	[31]	[0]
Other	**Mean**	**3199**	**2921**	**3244**	
	Standard error	837	973	964	none
	Median	1160	2500	800	

In an effort to understand how much of these fishing-related expenditures stay in Hawaii and contribute to the local economy, we asked fishermen what percentage of these expenditures was purchased out-of-state, either online or through a mail-order catalog. The majority of these expenditures can be directly linked to the State of Hawaii economy, as 48% of fishermen reported that *all* of their fishing expenditures occurred in the State of Hawaii. This varied somewhat across counties as 51% of Oahu fishermen reported that *all* of their fishing expenditures occurred in the State of Hawaii, relative to Hawaii (27%), Maui Nui (13%) and Kauai (9%) fishermen. A mere 2% indicated that all of their expenditures were off-island. For the fishery on the whole, approximately 18% of fishery expenditures occurred out of state. The average percentage of out-of-state expenditures for subgroups of the fishery is presented in Table 40.

Table 40.--Survey Responses: "What percentage of these expenditures were purchased out of state?"

Percentage of Expenditures [*n*]	Mean (%)	St.error	Median
Full Sample [455]	**17.7**	**1.2**	**3.0**
by County			
Kauai [55]	30.7	4.2	25.0
Oahu [191]	11.1	1.5	0.0
Maui [87]	23.0	3.0	10.0
Hawaii [119]	18.3	2.4	1.0
by Classification			
Commercial [426]	18.3	1.3	5.0
Highliner [46]	22.6	4.5	7.5
Not Highliner [380]	17.8	1.3	5.0
Noncommercial [29]	8.4	3.6	0.0
by Target			
Deep 7 [269]	19.1	1.6	5.0
Other BMUS/None [186]	15.6	1.9	0.0

Levels of Investment

In the survey, MHI bottomfish fishermen detailed the significant levels of investment they have in fishing. The average vessel in the fleet cost approximately $35,940 when purchased. On average, as a result of the larger vessel size as presented in Table 41, fishery highliners' vessel purchase cost is greater than other participants in the fleet. Nearly 61% of vessels were purchased used and, on average, approximately 37% required financing. Average loan amounts were very similar across subgroups of the fleet.

Table 41.--Vessel purchase characteristics: means, standard errors, and medians.

Variable [*n*]		Full sample [432]	Highliner [44]	Not Highliner [365]	Noncommercial [23]
Boat Cost (in dollars)	**Mean**	**35,940**	**58,796**	**33,323**	**33,752**
	Standard error	1647	7395	1645	5664
	Median	25,000	42,500	24,000	30,000
Purchased New/ Used (%)	New	39.2	38.6	37.6	64.0
	Used	60.8	61.4	62.4	36.0
Purchased Financed? (%)	Cash Only	62.6	72.7	61.1	68.2
	Cash and Loan	24.4	22.7	24.9	18.2
	Loan Only	12.9	4.6	13.9	13.6
		[146]	[9]	[130]	[7]
Original Loan Amount (in dollars)	**Mean**	**33,012**	**38,167**	**32,433**	**37,143**
	Standard Error	2358	10,345	2480	12,341
	Median	25,000	35,000	25,000	30,000

To better understand the overall investment that MHI bottomfish fishermen currently have in fishing, we asked them to estimate a current market value of the electronics and gear that they currently use (considering age and condition). Likewise, we had fishermen estimate a current market value for their boat (considering age and condition, including trailer, if applicable). On average, we find the current value of electronics currently used for fishing to be approximately $3,671, with fishery highliners having a larger investment than other fishermen. Also, noncommercial permit holders, on average, have the least amount invested in fishing electronics. Average investment in fishing gear was rather consistent across subgroups of the fishery. Many estimated the market value of their vessel to be very similar to the purchase price in nominal terms; however, if one were to correct purchase prices for inflation, there is clear evidence of fishermen accounting for depreciation.

Table 42.--Levels of investment: means, standard error, minimums and maximums.

Variable [*n*]		Full sample [352]	Highliner [39]	Not Highliner [296]	Noncommercial [17]
Market Value, Electronics	**Mean**	**3671**	**5336**	**3561**	**1776**
	Standard error	198	655	215	339
	Median	2350	5000	2000	2000
Market Value, Gear	**Mean**	**4334**	**5603**	**4245**	**2959**
	Standard error	231	893	243	749
	Median	3000	4000	3000	1500
Market Value, Boat *(including motor(s) and trailer)*	**Mean**	**33,840**	**52,897**	**31,631**	**28,588**
	Standard error	1661	6142	1723	5872
	Median	25,000	50,000	20,000	20,000

Because we were also interested in the role technology played in fishing operations, we asked fishermen to describe when they last upgraded their fishing electronics. Only about 17% of the fleet had upgraded their fishing electronics within the past year, whereas the

remainder of survey respondents was split evenly between 1-3 years ago and more than 3 years ago. Fishery highliners had the highest percentage of responses that suggested upgrades in the past year (28%), whereas a majority of noncommercial permit holders (55%) last upgraded their electronics over 3 years ago.

Crew Considerations

A majority of the fleet (82%) consists of two-person operations with a captain and one crew member. On the island of Hawaii, 90% of fishermen fit this profile, relative to 76% for Oahu fishermen. An additional 14% reported a fishing crew of two plus the captain, for a total of three people on board. A mere 4% reported having crews of more than two people. Noncommercial permit fishermen had larger crew sizes, on average, as 40% of fishing operations consisted of two crew-one captain setups. Alternatively, a relatively large portion of the fleet (34%) reported that they always fish bottomfish alone, and this behavior varied slightly by county. Forty-four percent of Kauai fishermen reported fishing alone the most, whereas only 21% of Maui fishermen fished alone.

Despite these findings, there are important implications for crew in this fishery. Crew on commercial fishing trips (wherein fish are sold) are required by law in the State of Hawaii to hold a valid commercial marine license, although they are not required to file catch reports. A number of fishermen (approximately 9%) in our sample identified themselves as bottomfish crew (non-boat owners). We found that while 65% indicated that they always fish on the same boat with the same captain, nearly half (47%) indicated that they never report their individual catch on bottomfish trips.

We asked crew survey respondents about compensation arrangements for their time and assistance and found a diversity of responses across the fleet. According to crew survey respondents, approximately 30% reported that they keep a percentage of total fish caught with the mean percentage being 30%. For crew members involved in commercial fishing, 20% reported that they receive a share of trip revenues (an average of 29%). Another 11% indicated that they pay a portion of the trip costs to go fishing. No crew members reported that they keep all the fish they catch, and 38% reported that they receive no compensation for their time as bottomfish crew members, many of which indicated that they were family or friend who simply enjoyed fishing. An additional 22% stated that compensation varied from trip to trip.

We also asked vessel owners how they compensated their crew. The highest percentage of boat owners, as noted above, indicated that they always fish alone and thus carry no crew with them. The most common compensation whether considering catch or revenues appeared to be 1/3 captain, 1/3 crew, and 1/3 to the vessel. Nearly 25% of boat captains indicated that they compensate their crew by giving them a percentage of fish caught. On average, the percentage reported by vessel owners mirrors that of the crew respondents, as approximately 32% of fish is kept by the crew (see Table 43). Additionally, 20% of boat owners (limited to those who sell fish) reported compensating crew with a share (31%) of fishing revenues for the trip (Table 44).

Table 43.--Survey Responses: "If you are the boat captain on bottomfish trips, how do you typically compensate your crew – give a percentage of fish caught?"

Percentage of Catch [*n*]	Mean (%)	St.error	Median
Full Sample [94]	**32.4**	**1.9**	**30.0**
by Classification			
Commercial			
Highliner [3]	20.0	7.6	25.0
Not Highliner [84]	32.0	2.0	30.0
Noncommercial [7]	41.4	8.6	50.0

Table 44.--Survey Responses: "If you are the boat captain on bottomfish trips, how do you typically compensate your crew – give a percentage of fish revenues?"

Percentage of Revenues [*n*]	Mean (%)	St.error	Median
Full Sample [88]	**30.9**	**1.4**	**30.0**
by Classification			
Commercial			
Highliner [18]	29.0	1.3	30.0
Not Highliner [70]	31.7	1.8	30.0

Another 29% of vessel owners stated that compensation differs from trip to trip, depending on the trip outcome. We included an open-ended probe for these respondents to try to understand the variety of compensation schemes used across the fleet. About 15% of these respondents provided some explanation, and these responses reflect the diversity of fishing operations within the MHI bottomfish fleet. Nearly 21% emphasized that their bottomfish fishing was strictly a family endeavor with children and/or wives as crew. Others suggested that compensation differed whether crew was made up of family members or friends. Additionally, many captains noted that they have an equal share of compensation but the actual compensation varied from trip to trip.

Social Aspects of Bottomfish Fishing

This section describes important social and cultural considerations that are useful in understanding motivations and behavior of bottomfish fishermen in the MHI. We describe catch disposition, family and social networks, issues of food security, and fisher classification.

Catch Disposition, Family and Social Networks

The breakdown of catch disposition in the Hawaii bottomfish fishery reflects the cultural motivations towards fishing and sheds light on the complexities of classifying catch in the context of a quota (see Table 45). Approximately 24% of bottomfish catch was reported to be consumed at home, while 33% was given away to relatives, friends, or crew with approximately 40% of bottomfish sold. This diversity of catch disposition extends to highliners in the fishery, as fishermen who reported catch greater than 1000

pounds of Deep 7 bottomfish in the past 12 months still retain approximately 20% of the bottomfish they catch for home consumption and participation in traditional fish-sharing networks and customary exchange.

The significant percentage of fish caught for home consumption, relatives, and friends reflects the strong family and social connections associated with this fishery. A number of bottomfish fishing operations are family businesses or husband and wife operations. Additionally, fishermen reported that an average of approximately 2% of their bottomfish catch goes to community and cultural events across the State of Hawaii. These findings validate the importance of bottomfish fishing in terms of building and maintaining social and community networks, perpetuating fishing traditions, and providing fish to local communities as a source of food security.

Table 45.--Survey Responses: "In the past 12 months, what percentage of your *bottomfish* catch was:"

Percentage of Responses [*n*]	Consumed at Home	Given to relatives	Given to Friends/ Neighbors	Given to crew	Exchanged for goods/ services	Community/ Cultural Event	Sold
Full Sample [480]	**23.5**	**11.5**	**10.8**	**10.8**	**1.3**	**1.9**	**39.9**
by County							
Kauai [53]	22.4	11.7	11.7	8.5	2.5	3.5	39.7
Oahu [203]	25.1	13.4	12.1	12.3	1.4	0.9	34.6
Maui [95]	22.4	10.8	9.6	10.6	1.3	3.1	42.2
Molokai [7]	8.1	8.3	12.7	6.6	2.3	5.3	56.7
Lanai [8]	29.3	14.6	21.5	15.3	0.8	6.3	12.4
Maui [80]	22.9	10.7	8.1	10.5	1.3	2.6	43.9
Hawaii [126]	21.9	9.0	9.5	9.7	0.8	1.9	46.9
by Classification							
Commercial [442]	22.3	10.8	9.9	10.3	1.4	1.9	43.3
Highliner [48]	5.0	4.6	4.2	4.4	1.8	1.9	78.0
Not Highliner [394]	24.4	11.6	10.6	11.0	1.4	1.9	39.0
Noncommercial [38]	38.2	19.4	21.8	17.2	0.1	1.1	2.2
by Target							
Deep 7 [264]	21.1	10.4	9.0	8.9	1.4	1.8	47.4
Other BMUS/None [178]	24.1	11.5	11.2	12.3	1.5	2.3	37.1

Although a large portion of the fishery typically fishes alone, nearly half of the fishery (51%) seem to engage with other fishermen to share bottomfish fishing information (Table 46). We find that a majority of fishery highliners (76%) are active in these social networks, and Deep 7 bottomfish fishermen (57%) appear to be slightly more reliant on social interactions with other fishermen relative to those who target other BMUS or have no particular target species (42%).

Table 46.--Survey Responses: "Do you have a network of fishermen that you share bottomfish fishing information with?"

Percentage of Responses [*n*]	Yes (%)	No (%)
Full Sample [514]	**50.8**	**49.2**
by County		
Kauai [60]	53.3	46.7
Oahu [215]	52.1	47.9
Maui [98]	54.1	45.9
Molokai [8]	37.5	62.5
Lanai [8]	37.5	62.5
Maui [82]	57.3	42.7
Hawaii [138]	45.7	54.3
by Classification		
Commercial [473]	51.8	48.2
Highliner [49]	75.5	24.5
Not Highliner [424]	49.1	50.9
Noncommercial [41]	39.0	61.0
by Target		
Deep 7 [294]	57.1	42.9
Other BMUS/None [220]	42.3	57.7

Food Security

In addition to the social importance evident in the disposition of bottomfish catch, a majority of bottomfish fishermen consider the bottomfish they catch to be an important source of food for their families (see Table 47). Nearly 63% of our survey respondents attested to the importance of bottomfish for family consumption. We find slight variation across the State of Hawaii as the majority of Maui Nui fishermen (78%) agreed that bottomfish are an important source of food for fisher families. However, just over half (51%) of Oahu bottomfish fishermen agreed with this statement. This suggests that bottomfish are an important source of food security for fishermen and local communities.

Table 47.--Survey Responses: "Are the bottomfish you catch an important source of food for your family?"

Percentage of Responses [*n*]	Yes	No	Don't Know
Full Sample [507]	**62.6**	**33.3**	**4.1**
by County			
Kauai [59]	62.7	30.5	6.8
Oahu [215]	51.2	45.1	3.7
Maui [94]	77.7	21.3	1.1
Molokai [8]	87.5	12.5	0.0
Lanai [7]	85.7	14.3	0.0
Maui [79]	76.0	22.8	1.2
Hawaii [136]	65.4	29.4	5.2
by Classification			
Commercial [468]	61.8	34.2	4.1
Highliner [49]	57.1	42.9	0.0
Not Highliner [419]	62.3	33.2	4.5
Noncommercial [39]	56.4	41.0	2.6
by Target			
Deep 7 [293]	66.2	31.1	2.7
Other BMUS/None [214]	54.7	39.7	5.6

As we have shown that bottomfish is just a portion of the total fishing effort and catch for the fleet, we also asked about the importance of non-bottomfish catch in providing food security for one's family (Table 48). A slightly higher percentage of fishermen (70%) considered the non-bottomfish fish they catch to be an important source of food, relative to bottomfish. All fishermen (100%) from Molokai and Lanai reported that their non-bottomfish catch is a vital source of food for their families. Again, we find Oahu fishermen, at 58%, with slightly less perceived importance of fish as food security, relative to the neighbor islands with over 76% considering the non-bottomfish they catch to be important for home consumption.

Table 48.--Survey Responses: "Are the non-bottomfish fish you catch an important source of food for your family?"

Percentage of Responses [*n*]	Yes	No	Don't Know
Full Sample [507]	**69.8**	**27.6**	**2.6**
by County			
Kauai [60]	78.3	18.3	3.3
Oahu [215]	57.7	39.5	2.8
Maui [94]	79.8	18.1	2.1
Molokai [8]	100.0	0.0	0.0
Lanai [8]	100.0	0.0	0.0
Maui [79]	76.0	21.5	2.5
Hawaii [135]	78.5	19.3	2.2
by Classification			
Commercial [468]	70.1	27.1	2.8
Highliner [49]	61.2	38.8	0.0
Not Highliner [419]	71.1	25.8	3.1
Noncommercial [39]	66.7	33.3	0.0
by Target			
Deep 7 [292]	71.6	27.4	1.0
Other BMUS/None [215]	67.4	27.9	4.7

Fisher Classification

An inherent difficulty in the future management of this and other small boat fisheries in the Western Pacific region is that of fisher classification. While the Magnuson-Stevens Act and the State of Hawaii have clear legal definitions of commercial fishing, these regulatory definitions do not consider cultural motivations towards fishing in the Pacific and are not adequate in properly describing fishing behavior, attitudes, and perceptions. Research has shown that fisher perceptions do not align well with regulatory frameworks (Hospital, et al., 2011; Hamilton, 1998).

To help improve our understanding of this, we first asked fishermen to define what commercial fishing meant to them. Fishermen were presented with a menu of options, including the State of Hawaii definition, some federal definitions, and a variety of scales of market participation. We allowed fishermen to choose all responses that they felt applied to define a fisherman as commercial. As shown in Table 49, the majority of respondents agree that selling fish for profit, earning a majority of income from fishing, and relying solely on fishing to provide income all constituted commercial fishing. However, there was less agreement on other legally established definitions. For instance, only 25% considered selling one fish to be commercial fishing, although that is technically the definition in the State of Hawaii. Only 31% considered selling a portion of fish to cover trip expenses to be commercial fishing. Likewise the Federal definition considering the trade and barter of fish as commercial activity is rejected by survey respondents, as only 14% considered that activity to be commercial. Additionally, very few fishermen associated selling fish to friends and neighbors to be commercial fishing.

These findings have important implications on the future monitoring and management of the fishery.

Table 49.--Survey Responses: "How would you define a fisherman as commercial (check all that apply*)?"

Percentage of Responses [*n*]	**Full Sample [519]**	Kauai [61]	Oahu [219]	Molokai [8]	Lanai [8]	Maui [82]	Hawaii [138]	CML Highliner [49]	CML - Not Highliner [428]
Sells at least one fish	**25.4**	22.9	25.1	37.5	50.0	19.5	26.8	28.6	24.5
Sells a portion of fish to cover trip expenses	**31.2**	26.2	32.9	25.0	50.0	30.5	30.4	18.4	32.5
Sells fish over and above trip expenses to make a profit	**57.0**	47.5	60.7	37.5	62.5	62.2	53.6	46.9	57.5
Sells fish only to friends and neighbors	**15.2**	18.0	15.1	12.5	12.5	20.7	11.6	16.3	15.2
Exchanges fish for goods and/or services	**13.9**	5.0	17.8	12.5	12.5	14.6	11.6	18.4	12.9
Earns the majority of their income from fishing	**56.5**	62.3	58.9	62.5	75.0	51.2	52.2	61.2	54.9
Relies solely on fishing to provide income	**54.3**	57.4	55.3	62.5	75.0	54.9	50.0	63.3	53.0
Other definition	**5.2**	1.7	5.0	0.0	12.5	7.3	5.8	0.0	6.1

*Does not add up to 100% b/c fishermen were allowed to choose multiple responses.

After asking fishermen to define commercial fishing, we followed up by asking fishermen to self-classify themselves. While 91% of our survey population held a State of Hawaii commercial marine license (CML), a mere 60% self-classified themselves as commercial bottomfish fishermen. As one would expect, nearly all fishery highliners (98%) defined themselves as commercial, although for other CML holders only 60% self-classified themselves as commercial. As noted earlier in this report, 21% of CML holders did not report the sale of bottomfish in the past 12 months, but even when considering this we find evidence of a disconnect between fisher's perceptions and regulatory frameworks. The distribution of self-classification by subgroups of the fishery is presented in Table 50.

Table 50.--Survey Responses: "How would you define yourself as a bottomfish fisherman (check all that apply*)?"

Percentage of Responses [*n*]	Full-Time Commercial	Part-Time Commercial	Recreational	Subsistence	Other	Multiple Motivations
Full Sample [519]	**7.1**	**52.6**	**40.7**	**14.3**	**8.7**	**19.7**
by County						
Kauai [61]	9.8	62.3	36.1	13.1	6.6	22.9
Oahu [219]	5.0	46.1	47.9	10.9	7.8	16.9
Maui [98]	9.2	53.1	33.7	17.4	11.2	19.4
Molokai [8]	25.0	25.0	0.0	0.0	50.0	0.0
Lanai [8]	0.0	25.0	75.0	25.0	12.5	37.5
Maui [82]	8.5	58.5	32.9	18.3	7.3	19.5
Hawaii [138]	7.9	57.9	35.6	18.1	9.4	22.5
by Classification						
Commercial [477]	7.6	56.6	36.1	14.5	9.5	20.1
Highliner [49]	34.7	63.3	6.1	12.2	10.2	14.3
Not Highliner [428]	4.4	55.8	39.5	14.7	9.4	20.8
Noncommercial [42]	0.0	7.1	92.9	11.9	0.0	14.3
by Target						
Deep 7 [297]	7.1	62.3	35.4	14.5	5.7	20.5
Other BMUS/None [222]	7.2	39.6	47.8	13.9	12.6	18.5

*Does not add up to 100% b/c fishermen were allowed to indicate multiple classifications.

In taking a closer look at perceptions of fisher classification, relative to existing regulatory frameworks and behavior, approximately 30% of fishermen from our survey self-classified themselves as *exclusively* "recreational" bottomfish fishermen. However, of this group, 40% reported selling bottomfish in the past 12 months fitting state and federal definitions of commercial fishing. Additionally, 10% of this subgroup reported selling 50% or more of their bottomfish catch in the past year. We did not find significant differences across the State of Hawaii, although 48% of self-classified "recreational" fishermen from the island of Hawaii reported selling fish, relative to 34% of Oahu fishermen self-classified as "recreational."

CONCLUSION

Using results of a survey fielded in 2010, this paper has described current fishing activity, operational and behavioral aspects of bottomfish fishing, and the levels of investment and economic expenditures associated with MHI bottomfish fishermen. We have also detailed the important social and cultural linkages the fishery provides, which likely has significant influence on the motivations and behavior of MHI bottomfish fishermen.

In terms of profitability, we find that while fishery highliners appear to be able to recover trip expenditures and make a profit from bottomfish fishing trips, many supplement their income with other fishing activities. Additionally, using official State of Hawaii dealer reports we found that 43% of fishermen reporting the sale of bottomfish earned

bottomfish revenues of less than $500 which would not cover overall trip expenditures for the year. However, based on the average catch disposition of MHI bottomfish, it is clear that for a large majority of fishery participants the social and cultural motivations for bottomfish fishing far outweigh any economic prospects. The bottomfish fishery in Hawaii is steep in tradition, as fisheries skills and knowledge have been passed down from generation to generation. It is a unique example of an artisanal fishery.

We find the MHI bottomfish fishery to be a complex mix of commercial, recreational, cultural, and subsistence fishermen whose fishing behaviors do not fit easily into existing legal and regulatory frameworks, therefore complicating the monitoring and management aspects of the fishery. This is the first study to specifically address the MHI bottomfish fleet, and it establishes important baselines for assessing the economic and social impacts of any future management actions.

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APPENDIX. SURVEY INSTRUMENT

OMB Control # 0648-0369 Expiration Date 02/28/2013

Aloha, help us to better understand bottomfish fishing in Hawaii. Your fishing experiences and opinions of bottomfish management are important for getting accurate results. We want to best represent bottomfish fishers in Hawaii and we can only do that by hearing from as many fishermen as possible. While your response is voluntary, we hope that you can help us in this research.

SECTION A. YOUR FISHING EXPERIENCES

Different bottomfish fishermen in Hawaii had different fishing experiences over the past 12 months. Please tell us about yours.

1. Approximately how many total fishing trips did you take over the past 12 months? (please check one)

- ☐ Less than 25 trips (about once every other week)
- ☐ 25 – 49 trips (about once a week)
- ☐ 50 – 99 trips (about once or twice a week)
- ☐ 100 – 200 trips (about two to three times a week)
- ☐ more than 200 trips (about four times a week)

2. In the past 12 months, how many of your fishing trips were primarily bottomfish trips: (please check one)

Almost all of my trips (90%-100%)	Most of my trips (60%-89%)	About half (40%-59%)	Some of my trips (10%-39%)	Very few of my trips (1%-9%)	None of my trips	
☐	☐	☐	☐	☐	☐	☐ don't know

3. When you fish for bottomfish do you **primarily** target (please check one)

- ☐ Deep 7 bottomfish
- ☐ Other bottomfish (shallow, less than 50 fathoms)
- ☐ I don't have any particular target species when I bottomfish
- ☐ Don't know

4. In the past 12 months, how many of your bottomfish trips did you fish for bottomfish in

	Almost all of my trips (90%-100%)	Most of my trips (60%-89%)	About half (40%-59%)	Some of my trips (10%-39%)	Very few of my trips (1%-9%)	None of my trips	
State waters only (0-3nm)	☐	☐	☐	☐	☐	☐	☐ don't know
Federal waters only (greater than 3nm)	☐	☐	☐	☐	☐	☐	☐ don't know
Both State and Federal Waters	☐	☐	☐	☐	☐	☐	☐ don't know

5. In the past 12 months, how many of your bottomfish trips were:

	Almost all of my trips (90%-100%)	Most of my trips (60%-89%)	About half (40%-59%)	Some of my trips (10%-39%)	Very few of my trips (1%-9%)	None of my trips	
Single day (or night) trips	☐	☐	☐	☐	☐	☐	☐ don't know
Multiday trips	☐	☐	☐	☐	☐	☐	☐ don't know

6. How long is your average bottomfish trip? ____ hours

7. How many people in total, including yourself, are on board for an average bottomfish trip? _____ people

8. Do you have a network of fishermen that you share bottomfish fishing information with? (current fishing conditions, fishing strategy, prices, etc.)

☐ YES
☐ NO

9. Do you always fish bottomfish out of the same boat ramp or harbor?

☐ YES **If you answered yes, go to Question 10**
☐ NO → *If no:*

9a. On average, how many different boat ramps or harbors do you use in a year? _____ ramps

10. On average, how far (one-way) do you travel to fish? _____ miles
If trailered, indicate one-way distance to most common ramp; If moored, please indicate one-way distance to slip

11. In the past 12 months, approximately how many total pounds of Deep 7 bottomfish did **you** catch?

☐ 0 – 50 pounds
☐ 51 – 100 pounds
☐ 101 – 500 pounds
☐ 501 – 1000 pounds
☐ 1001 – 2500 pounds
☐ More than 2500 pounds

12. In the past 12 months, approximately how many total pounds of other bottomfish did **you** catch?

☐ 0 – 50 pounds
☐ 51 – 100 pounds
☐ 101 – 500 pounds
☐ 501 – 1000 pounds
☐ 1001 – 2500 pounds
☐ More than 2500 pounds

SECTION B. WHAT DO YOU THINK?

Fishermen in Hawaii have very different attitudes and perceptions toward current management. We'd like to hear what you think.

The bottomfish fishery underwent significant changes three years ago with the institution of a total allowable catch (TAC) limit for Deep 7 bottomfish in the main Hawaiian Islands. For the following questions, we'd like to know how you feel about total allowable catch management for Hawaii bottomfish.

13. A total allowable catch (TAC) limit was needed to maintain a sustainable bottomfish fishery

Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	
☐	☐	☐	☐	☐	☐ don't know

14. TAC levels have been different in each of the last three years – do you feel the TAC level in each year was set... too high, about right, or too low?

YEAR	TAC Level	Too High	About Right	Too Low	
2007	178,000 pounds	☐	☐	☐	☐ don't know
2008	234,000 pounds	☐	☐	☐	☐ don't know
2009	254,050 pounds	☐	☐	☐	☐ don't know

15. What characteristics of a total allowable catch (TAC) program would you support?

	Strongly Support	Somewhat Support	Neutral	Somewhat Opposed	Strongly Opposed	
TAC for Deep 7 bottomfish only	☐	☐	☐	☐	☐	☐ don't know
TAC for <u>all</u> bottomfish species	☐	☐	☐	☐	☐	☐ don't know
TAC that only applies to commercial fishing	☐	☐	☐	☐	☐	☐ don't know
A separate TAC for commercial and recreational fishing	☐	☐	☐	☐	☐	☐ don't know
A separate TAC for each island	☐	☐	☐	☐	☐	☐ don't know
A TAC that covers multiple years	☐	☐	☐	☐	☐	☐ don't know

☐ I do not support any form of Total Allowable Catch management

<u>If you wish to add additional comments to clarify your response you may do so here:</u>

We'd like to now ask your level of satisfaction with fishery management agencies and recent management tools

16. How satisfied are you with bottomfish management agencies?

	Strongly Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Extremely Dissatisfied	
<u>Federal</u> management of Hawaii bottomfish	☐	☐	☐	☐	☐	☐ don't know
<u>State</u> management of Hawaii bottomfish	☐	☐	☐	☐	☐	☐ don't know

17. On a scale of 'Extremely Effective' to 'Not Effective At All' please mark your opinion of previous and current management actions on promoting a sustainable bottomfish fishery in Hawaii

	Extremely Effective	Somewhat Effective	Neutral	Somewhat Ineffective	Not effective at all	
Old bottomfish restricted areas (BFRAs)	☐	☐	☐	☐	☐	☐ don't know
New bottomfish restricted areas (BFRAs)	☐	☐	☐	☐	☐	☐ don't know
Summer closure in 2007	☐	☐	☐	☐	☐	☐ don't know
Bag limits for non-commercial fishermen	☐	☐	☐	☐	☐	☐ don't know
Non-commercial bottomfish permit requirements	☐	☐	☐	☐	☐	☐ don't know

<u>If you wish to add additional comments to clarify your response you may do so here:</u>

SECTION C. MARKET PARTICIPATION

18. People have different opinions on the definition of commercial fishing. How would you define a fisherman as commercial? (check all that apply)

- ☐ Sells at least one fish
- ☐ Sells a portion of fish after a good trip to cover trip expenses
- ☐ Sells fish over and above trip expenses to make a profit
- ☐ Sells fish only to friends and neighbors
- ☐ Exchanges fish for goods and/or services
- ☐ Earns the majority of their income from fishing
- ☐ Relies solely on fishing to provide income
- ☐ Other _____

19. How do you define yourself as a bottomfish fisherman? (check all that apply)

- ☐ Full-time commercial
- ☐ Part-time commercial
- ☐ Recreational
- ☐ Subsistence
- ☐ Other (specify) _____

20. In the past 12 months, what percentage of your bottomfish (BF) catch was:

	Almost all of my BF (90%-100%)	Most of my BF (60%-89%)	About half (40%-59%)	Some of my BF (10%-39%)	Very little of my BF (1%-9%)	None of my BF
Consumed at Home	☐	☐	☐	☐	☐	☐
Given to relatives	☐	☐	☐	☐	☐	☐
Given to crew	☐	☐	☐	☐	☐	☐
Given to friends/neighbors/ coworkers	☐	☐	☐	☐	☐	☐
Exchanged for goods/ services	☐	☐	☐	☐	☐	☐
Provided for community and/ or cultural event	☐	☐	☐	☐	☐	☐
Sold	☐	☐	☐	☐	☐	☐ → If none sold, go to Question 26, page 6

If you sold any of your bottomfish...

21. Where did you sell your bottomfish catch?

	Almost all of my BF (90%-100%)	Most of my BF (60%-89%)	About half (40%-59%)	Some of my BF (10%-39%)	Very little of my BF (1%-9%)	None of my BF
United Fishing Agency Auction (Honolulu)	☐	☐	☐	☐	☐	☐
Dealer/Wholesaler	☐	☐	☐	☐	☐	☐
Markets/Stores	☐	☐	☐	☐	☐	☐
Restaurants	☐	☐	☐	☐	☐	☐
Friends/neighbors/coworkers	☐	☐	☐	☐	☐	☐
Roadside Sales	☐	☐	☐	☐	☐	☐
Other (specify)_____	☐	☐	☐	☐	☐	☐

22. Can you usually sell all of your fish if you want to?

☐ YES ☐ Don't Know
☐ NO

If NO: why not?_____

23. I feel the prices I receive for bottomfish are:

☐ Higher than before TAC managment ☐ Lower than before TAC management
☐ About the same as before TAC management ☐ Don't know

24. In the past 12 months what percent of your personal income, before taxes, came from all your fishing?

Almost all (90%-100%)	Most (60%-89%)	About half (40%-59%)	Some (10%-39%)	Very little (1%-9%)	None
☐	☐	☐	☐	☐	☐

25. In the past 12 months what percent of your fishing income, before taxes, came from bottomfish fishing?

Almost all (90%-100%)	Most (60%-89%)	About half (40%-59%)	Some (10%-39%)	Very little (1%-9%)	None
☐	☐	☐	☐	☐	☐

26. Are the bottomfish you catch an important source of food for your family?

☐ YES ☐ Don't Know
☐ NO

27. Are the non-bottomfish fish you catch an important source of food for your family?

☐ YES ☐ Don't Know
☐ NO

SECTION D. VESSEL AND GEAR

In this section we want to better understand the vessel and gear characteristics of the bottomfish fishery

28. Do you own the boat that you fish bottomfish on?

☐ YES → **If yes, go to Question 29 on page 8**
☐ NO

28a. Do you always fish bottomfish on the same boat?

☐ YES
☐ NO

28b. Do you always fish bottomfish with the same captain?

☐ YES
☐ NO

28c. Do you report your bottomfish catch separately from others on the boat?

Always	Sometimes	Rarely	Never
☐	☐	☐	☐

28d. How are you compensated for your time as bottomfish crew? (if yes, check box and estimate percentage (%), check all that apply)

☐ I keep a percentage of total fish caught _____ % of fish caught
☐ I get a percentage of the value of the fish sold _____ % of value for trip
☐ I pay a percentage of trips costs _____ % of trip costs
☐ I keep all the fish I catch
☐ No compensation - I just like to fish
☐ Don't know/different every time

If you have some other compensation arrangement that you could detail please describe below:

Please continue to Section E on page 9 →

If you own the boat you bottomfish on:

29. What is the length of your boat? _____ feet

30. What is the horsepower? _____ hp

31. In what year was the boat built? _____

32. Do other people (other than family members) use the boat without you?

Often	Sometimes	Rarely	Never
☐	☐	☐	☐

33. If you are the boat captain on bottomfish trips, how do you typically compensate your crew?

- ☐ Given a percentage of total fish caught _____%
- ☐ Given a percentage of value of fish sold _____%
- ☐ Crew pays a percentage of trips costs _____%
- ☐ Crew keeps all the fish they catch
- ☐ I always fish alone
- ☐ Don't Know/different every time

If you have some other compensation arrangement that you could detail please describe below:

34. In what year did you purchase the boat you bottomfish on? _____
(if homebuilt – when did you complete it?)

35. How much did you pay to purchase the boat you bottomfish on? $ _____
(if homebuilt – how much did it cost to build it?)

36. Was the boat purchased…

☐ New ☐ Used

37. How did you purchase this boat?

- ☐ cash only
- ☐ cash and loan → *If cash and loan or loan only:*
- ☐ loan only → *If cash and loan or loan only:*

37a. What was the original loan amount? $ _____

38. What is the approximate market value, in dollars (considering age and current condition), of the **electronics** you currently use to fish? $ _____

39. When did you last upgrade your fishing electronics (GPS, fishfinder/recorder)?

this past year	1 to 3 years ago	over 3 years ago
☐	☐	☐

40. What is the approximate market value, in dollars (considering age and current condition), of the **gear** you currently use to fish (not including electronics)? $ _____

41. What is the approximate market value, in dollars (considering age and current condition), of your **boat** (including motor(s) and trailer, but not including gear, equipment, or electronics mentioned above)? $ _____

SECTION E. YOUR LAST BOTTOMFISH TRIP

We'd like to know how much it cost for your most recent bottomfish trip

42. Think about your last bottomfish trip, in what month and year was this trip made? _____ month

_____ year

43. How much money was spent on your most recent bottomfish trip?

Type of Expenditure	Trip Expenditure (most recent trip)	What type of fuel?
Boat fuel	$ _____	☐ gas ☐ diesel
Truck fuel (round-trip)	$ _____	☐ gas ☐ diesel
Ice	$ _____	
Bait	$ _____	
Food and beverage	$ _____	
Other (specify) _____	$ _____	

44. What percentage of these costs did you pay? _____%

SECTION F. 2009 FISHING EXPENDITURES

In an effort to better understand your economic contribution to the state of Hawai'i we would like to ask about your fishing-related expenditures in 2009. In the table below please indicate how much, if any, was spent on the following items during 2009.

Enter "0" if you did not have any expenses in a category. Please do not leave blank.
Remember that all your answers are strictly confidential.

45. Cost Category	2009 Expenditure (dollars)
Boat insurance	$_____
Loan payments	$_____
Financial services (accounting, taxes)	$_____
Moorage fees	$_____
Repair, maintenance, and improvements for vessel, engines, or trailer	$_____
Oil and lube	$_____
Gear (lines, lures, gaffs, rods, electric/hydraulic reels, coolers, etc.)	$_____
Electronics	$_____
Fees (CML, non-commercial permit ramp, registration for truck and trailer, club dues, etc.)	$_____
Safety Equipment	$_____
Other (specify)	$_____

46. Some fishermen purchase fishing gear, electronics, safetly equipment or other items online or through a catalog and shipped to Hawaii. Approximately what percentage of these expenditures were purchased out of state? _____ %

SECTION G. ABOUT YOU

Different people have different fishing experiences and different attitudes about management of Hawaii bottomfish. The following questions help us to better understand these differences.

47. What is your age?

- ☐ Less than 25 years
- ☐ 25 to 34 years
- ☐ 35 to 44 years
- ☐ 45 to 54 years
- ☐ 55 to 64 years
- ☐ more than 64 years

48. How long have you targeted bottomfish?_____ years

49. How would you describe your race? (check all that apply)

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Hispanic or Latino
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White

50. Are you currently employed?

- ☐ Employed full-time
- ☐ Employed part-time
- ☐ Retired
- ☐ Student (full-time)
- ☐ Student (part-time)
- ☐ Unemployed
- ☐ Other (specify)_____

51. What is the highest level of education you have completed?

- ☐ Less than 9th grade
- ☐ Some high school (no diploma)
- ☐ High school graduate (including GED)
- ☐ Some college (no degree)
- ☐ Associates degree or technical school
- ☐ College graduate (bachelor degree)
- ☐ Advanced, professional, or doctoral degree

52. What was your total household income, before taxes, in 2009, including fishing income?

- ☐ Less than $10,000
- ☐ $10,000 to $14,999
- ☐ $15,000 to $24,999
- ☐ $25,000 to $34,999
- ☐ $35,000 to $49,999
- ☐ $50,000 to $74,999
- ☐ $75,000 to $99,999
- ☐ $100,000 to $149,999
- ☐ $150,000 to $199,999
- ☐ $200,000 or more

SECTION H. YOUR PERCEPTIONS

Lastly, we'd like to ask you about your perceptions of current bottomfish fishing conditions.

53. I feel that I need to 'race' to catch bottomfish before the TAC is reached

Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	
☐	☐	☐	☐	☐	☐ don't know

54. I fish bottomfish less than I would like to because of the TAC limit

Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	
☐	☐	☐	☐	☐	☐ don't know

55. There are too many boats catching bottomfish

Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	
☐	☐	☐	☐	☐	☐ don't know

56. I fish in less safe sea conditions than I would like to

Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	
☐	☐	☐	☐	☐	☐ don't know

In the United States, and worldwide, many fisheries are being managed by 'catch share' systems. These systems allocate a specific portion of the total allowable catch of a fishery to individuals, cooperatives, communities, or other entities. Each existing program is designed differently to address the specific conditions of the fishery.

57. How familiar are you with 'catch share' systems?

Extremely Familiar	Somewhat Familiar	I have not heard of it	
☐	☐	☐	☐ don't know

58. In thinking about how to manage the Hawaii bottomfish fishery in the future, please indicate your level of approval for establishing a form of a 'catch share' system

Strongly Support	Somewhat Support	Neutral	Somewhat Opposed	Strongly Opposed	
☐	☐	☐	☐	☐	☐ don't know

59. What characteristics of a 'catch share' program would you support?

	Strongly Support	Somewhat Support	Neutral	Somewhat Opposed	Strongly Opposed	
Individual quota for each fisherman (everyone gets equal share)	☐	☐	☐	☐	☐	☐ don't know
Individual quota for each fisherman (based on catch history) that cannot be transferred	☐	☐	☐	☐	☐	☐ don't know
Individual quota for each fisherman (based on catch history) that is transferable	☐	☐	☐	☐	☐	☐ don't know
Quota allocated to fishing communities	☐	☐	☐	☐	☐	☐ don't know
Quota allocated to cooperatives or hui	☐	☐	☐	☐	☐	☐ don't know
A portion of quota reserved for new entrants (not currently in fishery)	☐	☐	☐	☐	☐	☐ don't know

☐ I would not support any form of 'catch share' program

If you wish to add additional comments to clarify your response or suggest an alternate way you may do so here:

Mahalo for participating in this survey.

Please use the enclosed postage paid return envelope to mail back your survey.

If you misplaced the envelope call Justin Hospital at 1-877-584-1288 for a replacement.

Please go to next page to provide additional comments →

Do you have any suggestions for how Hawaii's bottomfish fisheries should be managed or topics that you feel need further study? (please write in the space provided)

Would you like to receive a copy of the final report for this study?

☐ YES
☐ NO

Name:

Address:

May we contact you if we have any questions about your survey responses?

☐ YES Phone: _____ best time to reach you: _____
☐ NO (your phone number will be kept strictly confidential)

Paperwork Reduction Act Statement. The information you provide will remain strictly confidential as required by section 402(b) of the Magnuson-Stevens and NOAA Administrative Order 216-100, Confidentiality of Fisheries Statistics, and will not be released for public use except in aggregate statistical form without identification as to its source. We will combine your responses with information provided by other participants, and report it in summary form so that responses for any individual vessel can not be identified. Public reporting burden for this information collection, including time for gathering data needed and completing the survey, is estimated to average 45 minutes per respondent. Please provide comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Justin Hospital, NOAA Fisheries, 1601 Kapiolani Blvd. Suite 1110., Honolulu, HI 96814, 808-944-2188, Justin.Hospital@noaa.gov Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number